INDUSTRIAL DISEASES AND ACCIDENTS

W. J. GREER

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Industrial Diseases and Accidents

BY

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To

His Honour JUDGE OWEN

PREFACE.

My excuse for venturing to add one more to the great multitude of books is that it appeared to me, after some experience of industrial accidents and diseases in their medical and forensic aspects, that a single volume, in which brief descriptions of the symptoms and after-results of the more frequently recurring injuries and diseases were grouped together in a manner affording facilities for rapid and easy reference, would be acceptable to those of my colleagues who may be called upon to examine claimants for compensation.

The subject of trauma as an ætiological factor in disease is one of much interest and some obscurity, so I have laboured to set forth current opinions and to indicate sources from which fuller information may be derived.

While it is true that the arrangement of the articles in alphabetical order involves a certain risk of repetition, pains have been taken to avoid an excess of this defect, and it is hoped that the combination of this order with an index will render every subject readily accessible. An attempt has been made to simplify and explain the technical phraseology, in the hope that the book may be of service to members of the legal profession, and to others interested in industrial diseases and injuries.

My hospital colleague, Mr. R. J. Coulter, has very kindly undertaken the section on Injuries and Diseases of the Eye, and I am very glad to avail myself of his expert knowledge and experience.

It is not possible to write such a book without having recourse to the researches of many workers in different fields, and the published writings of Continental, American and English authors on the special subjects treated have been freely consulted. It has been my intention fully to acknowledge their labours by, in all cases, quoting the names of the authorities appealed to, and if any are overlooked in the text I would sincerely ask them to accept my apologies, as the omission has not been deliberate.

I would offer my most cordial thanks to the distinguished authors who have given me permission to use their special works.

Amongst them I would particularly mention Professor Thoinot, of Paris; Dr. Sand, of Brussels; Dr. Pearce Bailey, of New York; Dr. Hektoen, of Chicago; Sir William Gowers and Mr. James Sherren, of London. I very gladly acknowledge the help received from Mr. Albert Parsons, Barrister-at-Law, and Dr. Dawson Williams, Editor of the *British Medical Journal*. I have much pleasure in expressing my thanks to Mr. H. R. Wansbrough, Solicitor, Bristol, for many valuable hints. My old friend, Dr. Hamilton, has been assiduous in reading both the manuscript and proofs, and his aid has been as gratefully received as it has been generously given.

I consider myself fortunate in having obtained the services of Mr. T. P. Collings as an illustrator, and I am sure that his artistic work will be appreciated.

Lastly, I am beholden to the diligence of my wife, for without her assistance this volume could never have been written.

I am fully conscious that the book must, in the present position of the medical and economic questions involved, be incomplete ; but I offer it as a small contribution to a great subject, trusting that it may be found practically helpful. In any event, I will make bold to use the words of the wise and subtle Montaigne :—

> "Reader, lo here is a well-meaning book."

W. J. GREER.

19 Gold Tops,
Newport, Mon.,
October, 1909.

LIST OF AUTHORS AND WORKS OF REFERENCE USED IN THE TEXT.

Author.	Work.
ALLBUTT AND ROLLESTON	*Medicine.*
Annals of Surgery.	
BAILEY	*Diseases of the Nervous System resulting from Accidents and Injuries.*
BEAUMONT	*Injuries of the Eye.*
BECK	*Röntgen Rays.*
BECKER	*Lehrbuch der arztlichen Sachverstandigen Thatigkeit.*
British Medical Journal.	
BROUARDEL	*Les Accidents du Travail.*
BRYANT, J. D.	*Operations of Surgery.*
Bulletin Medical des Accidents du Travail (Bruxelles).	
Bulletin Medico-Chirurgical des Accidents du Travail (Paris).	
BUM	*Vorlesungen uber Arztliche Unfallkunde.*
BUTLER	*Diagnostics of Internal Medicine.*
CABOT	*Clinical Examination of Blood.*
CARTER	*Medicine.*
CASPER	*Text-book of Genito-urinary Diseases.*
CHAPUT	*Les Fractures Malleolaires.*
CHARCOT	*Nervous System* (Sydenham Society).
CALDWELL AND PUSEY	*Röntgen Rays.*
Clinical Journal.	
CROCKER	*Diseases of the Skin.*
CUSHING	*Transactions of American Surgical Association.* Vol. XVI. 1898.
Departmental Committee's Reports on Industrial Diseases.	
DE SCHWEINITZ AND RANDALL	*Diseases of the Eye, Ear, Nose and Throat.*
DORLAND	*Illustrated Medical Dictionary.*
DOUGLAS	*Surgical Diseases of the Abdomen.*
EISENDRATH	*Surgical Diagnosis.*
FOWLER	*Surgery.*
FUCHS	*Lehrbuch der Augenheilkunde.*

Author.	Work.
Gould and Warren	*Surgery.*
Golebiewski	*Diseases caused by Accidents.*
Gowers	*Diseases of the Brain and Spinal Cord.*
Græfe Sæmisch	*Handbuch der Gesamten.* *Augenheilkunde*, section by Professor Wagenmann on " Verletzungen des Auges mit Berucksichtigung der Unfallversicherung."
Gray	*Anatomy.*
Hektœn and Riesman	*Text-book of Pathology.*
Helferich	*Fractures and Dislocations.*
Jacobson	*Operations of Surgery.*
Jacoby	*Electrotherapy.*
Kelly	*The Appendix.*
Kelly and Noble	*Gynæcology and Abdominal Surgery.*
Kerr Love	*Diseases of the Ear.*
Kirke	*Physiology.*
Kurt Mendel	*Unfall in der Atiologie der Nervenkrankheiten.*
Lancet.	
Lenoir	*Conferences sur les Accidents du Travail.*
Luson and Hyde	*Diseases of Workmen.*
Marie	*Diseases of the Spinal Cord* (Sydenham Society).
Medical Annual.	
Mercier	*Insanity.*
Morris, H.	*Surgical Diseases of the Kidney.*
Morris, M.	*Diseases of the Skin.*
Norris and Oliver	*System of Diseases of the Eye*, especially section on " Wounds and Injuries of the Eyeball and its Appendages," by Emil Gruening, M.D.
Oliver	*Diseases of Occupation.*
Ollive and Le Meignen	*Accidents du Travail.*
Osler	*Medicine.*
Page	*Railway Injuries.*
Paget	*Surgery of the Chest.*
Poland	*Traumatic separation of the Epiphyses.*
Posey and Spiller	*The Eye and Nervous System.*
Quain	*Anatomy.*

AUTHOR.	WORK.
REMY	*L'Evaluation des Incapacities Permanentes.*
Revue de Chirurgie.	
ROBSON AND MOYNIHAN	*Diseases of the Stomach.*
ROHMER	*Evaluation des Incapacities Professionelles.*
SAND	*La Simulation et L'interpretation des Accidents du Travail*
SANTEE	*Anatomy of Brain and Spinal Cord.*
SCHLESINGER	*Indications for Operation.*
SCHULTZE AND STEWART	*Atlas of Topographic Anatomy.*
SCUDDER	*Fractures.*
Semaine Medicale.	
SHERREN	*Injuries of Nerves.*
SNELL	*Miner's Nystagmus.*
STERN	*Ueber traumatische Entstehung innerer Krankheiten.*
STIMSON	*Fractures and Dislocations.*
SWANZY AND WERNER	*Hand-book of Diseases of the Eye.*
TAYLOR	*Medical Jurisprudence.*
TAYLOR, E. H.	*Applied Anatomy.*
THIEM	*Hand-buch der Unfallerkrankungen.*
THOINOT	*Les Accidents du Travail et les Affections Medicales.*
THORNDIKE	*Orthopedic Surgery.*
TUBBY	*Deformities.*
TILLMANNS	*Surgery.*
WALSH	*Röntgen Rays.*
WATSON AND CUNNINGHAM	*Diseases and Surgery of the Genito Urinary System.*
WHITLA	*Medicine.*
YOUNG	*Orthopedic Surgery.*

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LIST OF
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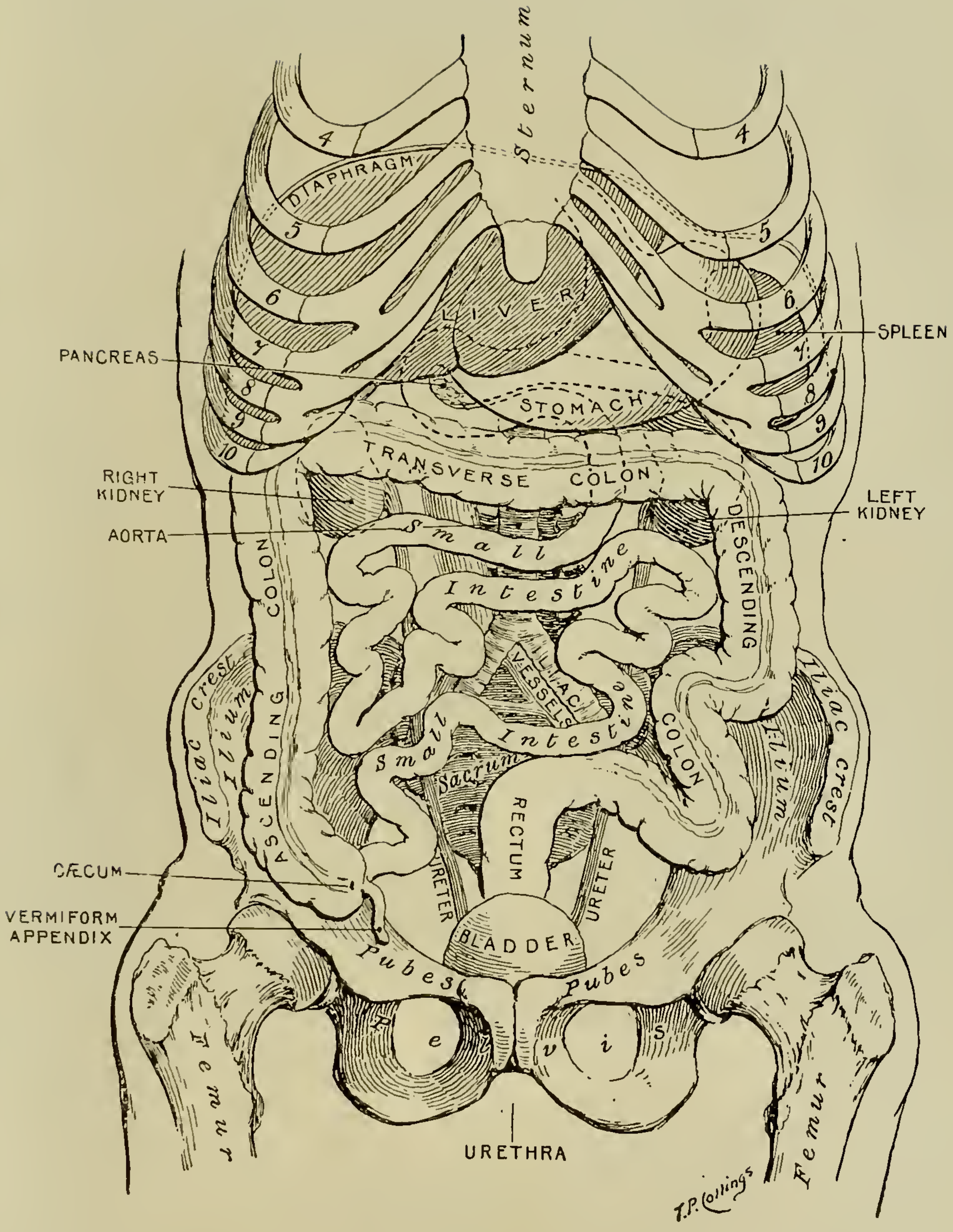

PLATE I.

Abdomen, showing Viscera.

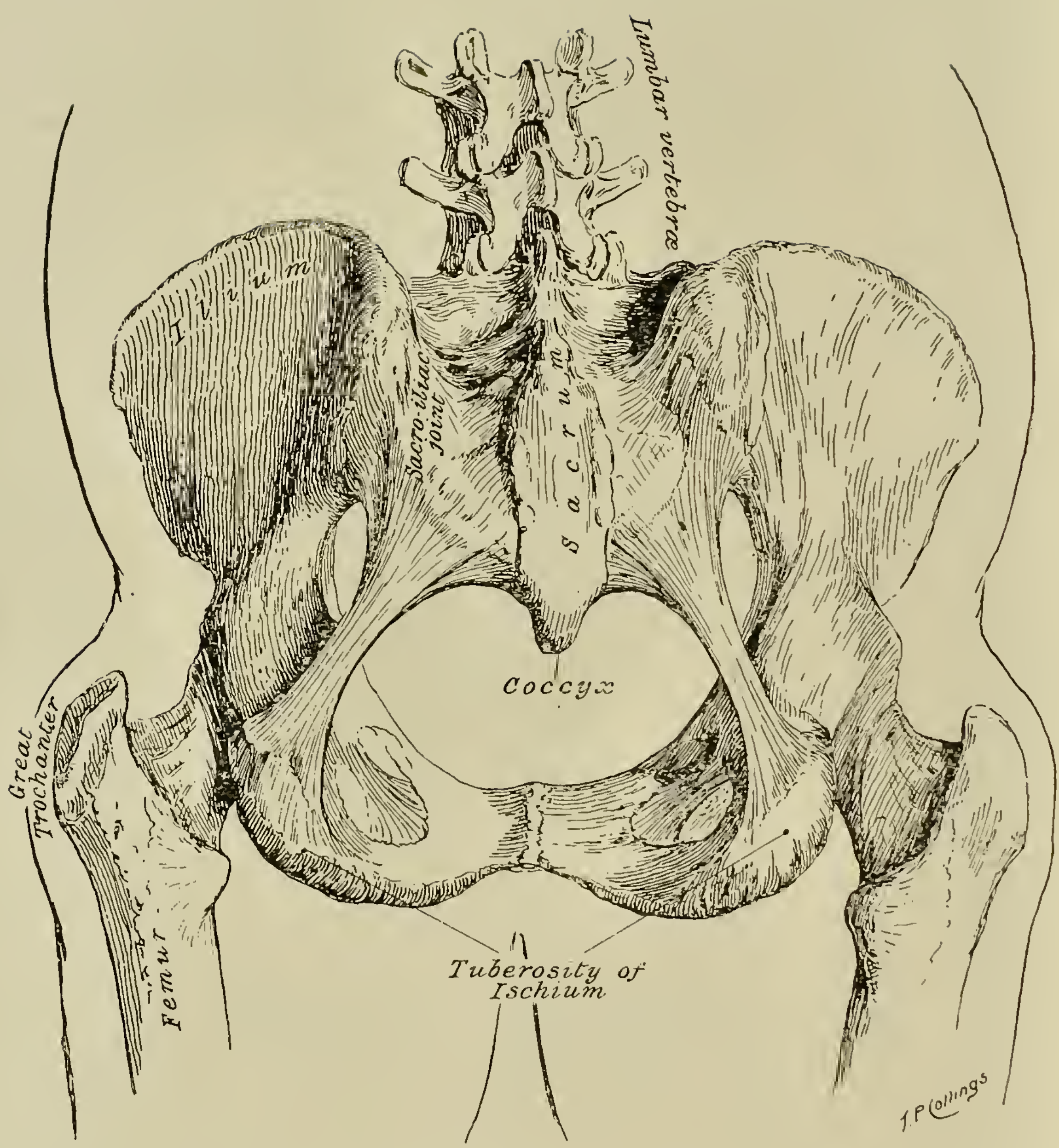

PLATE II.

Back view of Pelvis, showing Sacrum, Lumbar Vertebræ, and Hip-Joints.

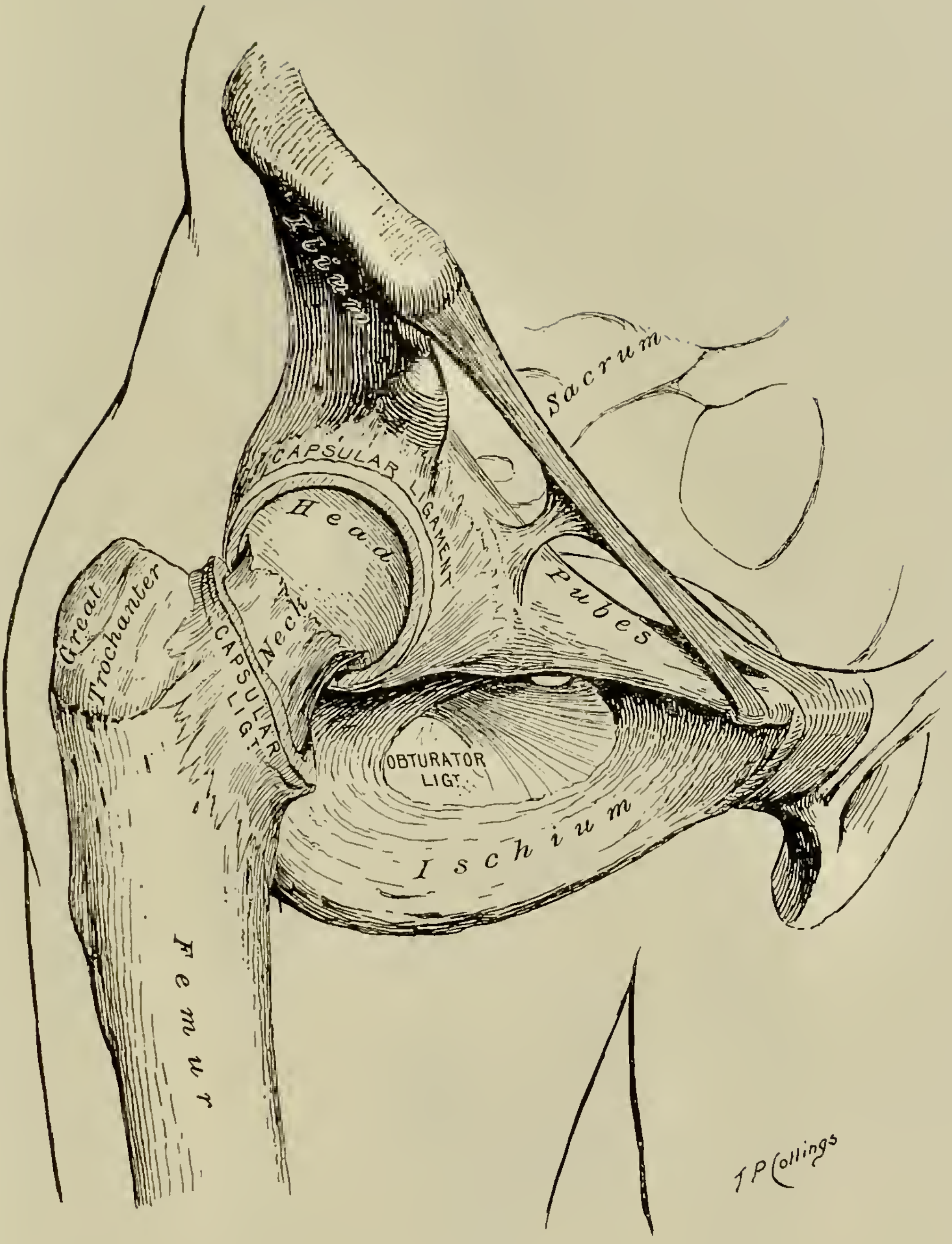

PLATE III.

Hip-Joint: Capsule removed to show Head of Femur in Acetabulum.

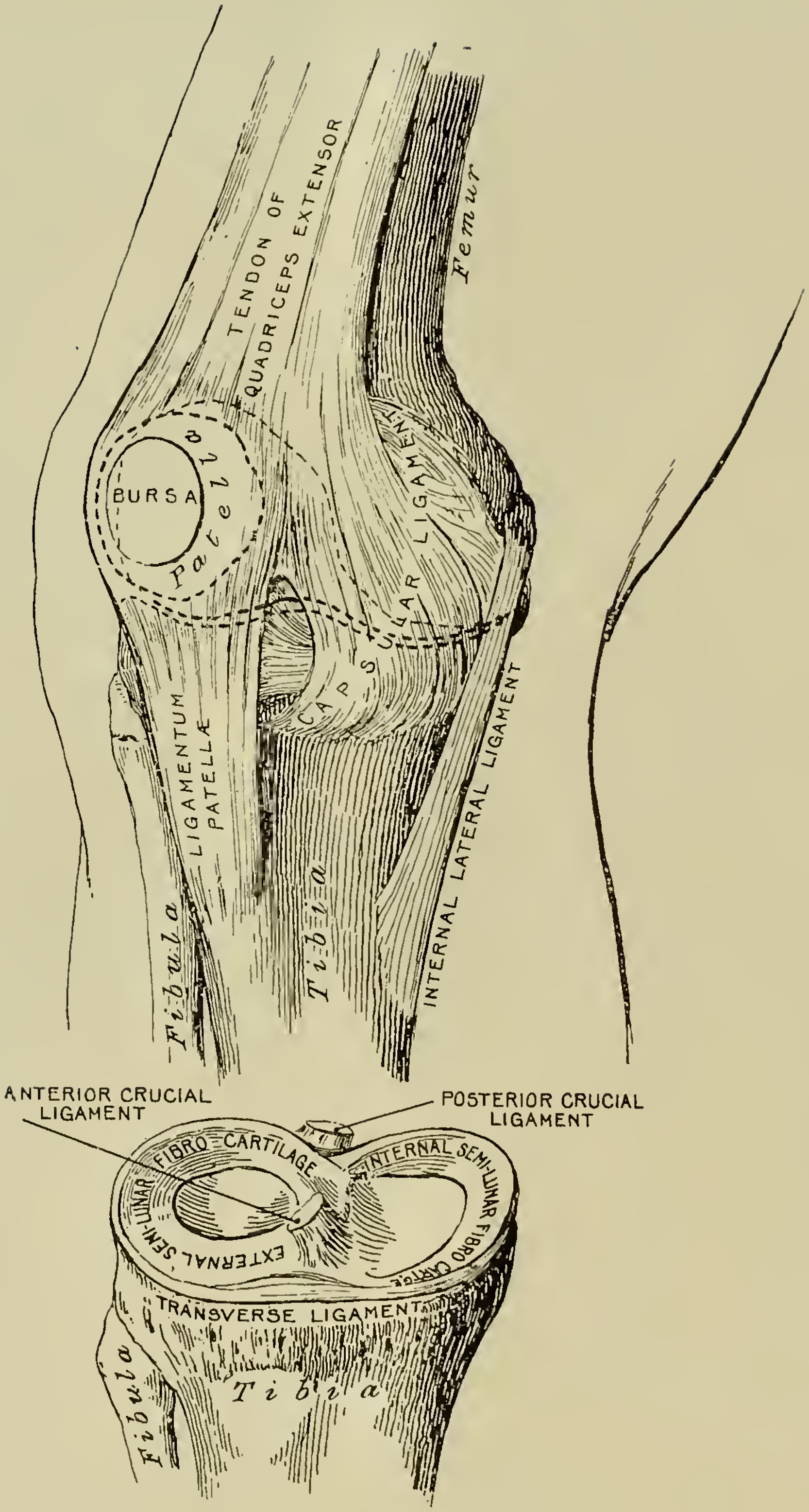
Femur
TENDON OF QUADRICEPS EXTENSOR
BURSA
Patella
CAPSULAR LIGAMENT
LIGAMENTUM PATELLÆ
Fibula
Tibia
INTERNAL LATERAL LIGAMENT
ANTERIOR CRUCIAL LIGAMENT
POSTERIOR CRUCIAL LIGAMENT
FIBRO-CARTILAGE
INTERNAL SEMI-LUNAR FIBRO CARTILAGE
EXTERNAL SEMI-LUNAR
TRANSVERSE LIGAMENT
Fibula
Tibia

PLATE IV.

Knee-Joint (modified from Gray and Henle), showing External Parts, also a View of the Semi-lunar Cartilages and Crucial Ligaments.

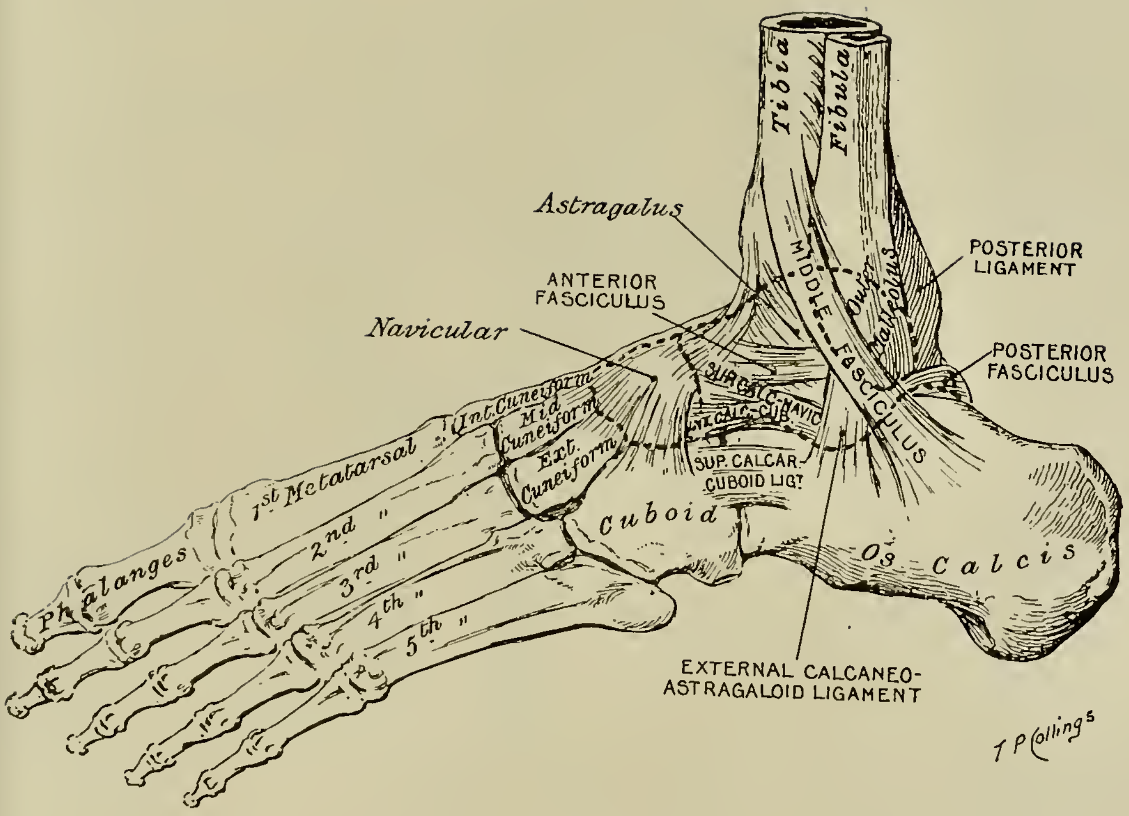

PLATE V.

Foot, showing Ligaments at the Ankle Joint.

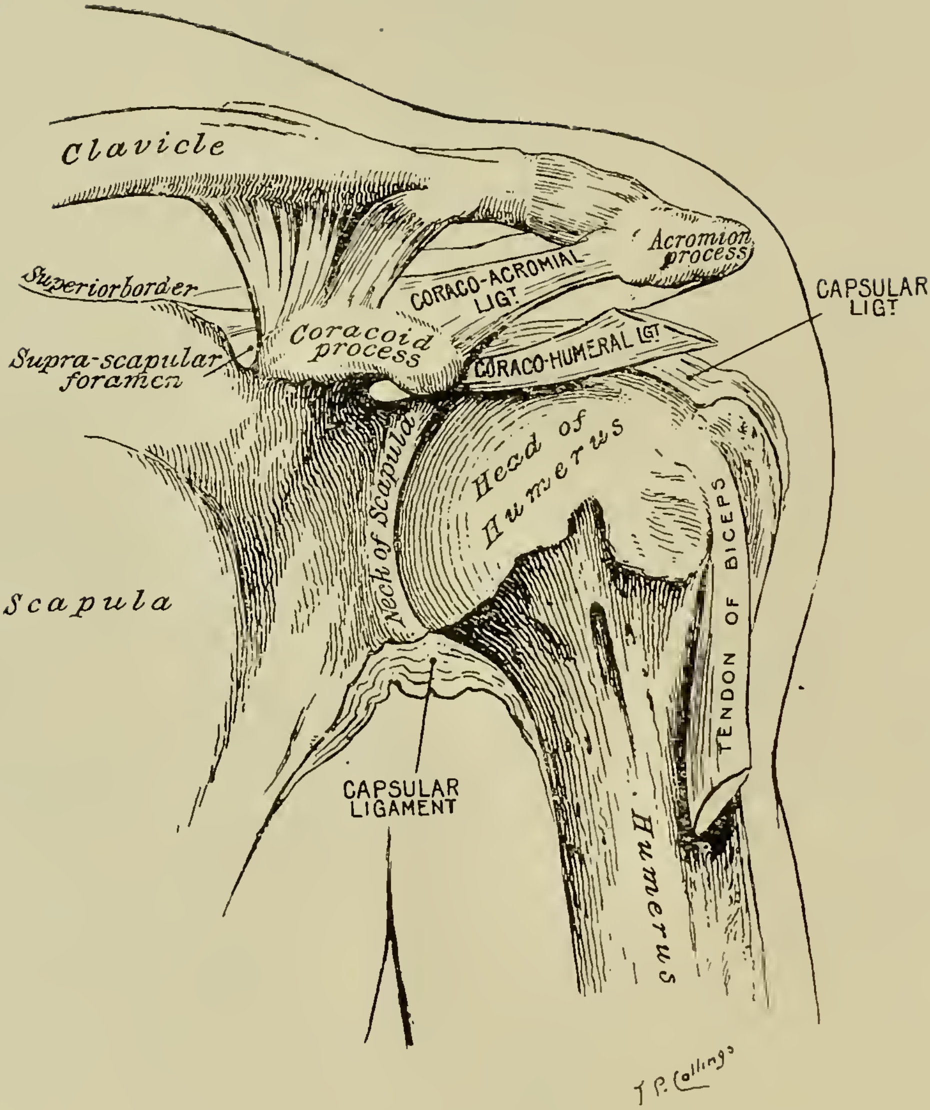

PLATE VI.

Shoulder-Joint (modified from Gray): Capsule Removed to show Head of Humerus in Glenoid Cavity.

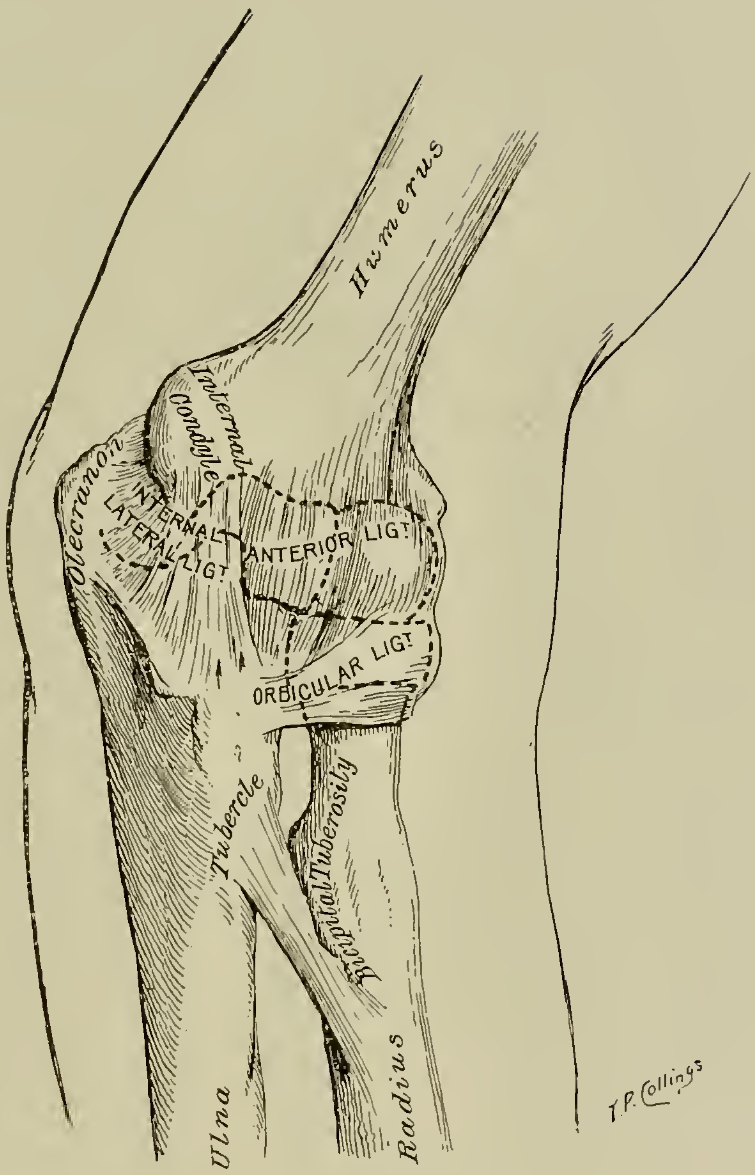

PLATE VII.

Elbow-Joint (modified from Gray), showing through the Capsule the Outlines of the Upper Ends of the Radius and Ulna.

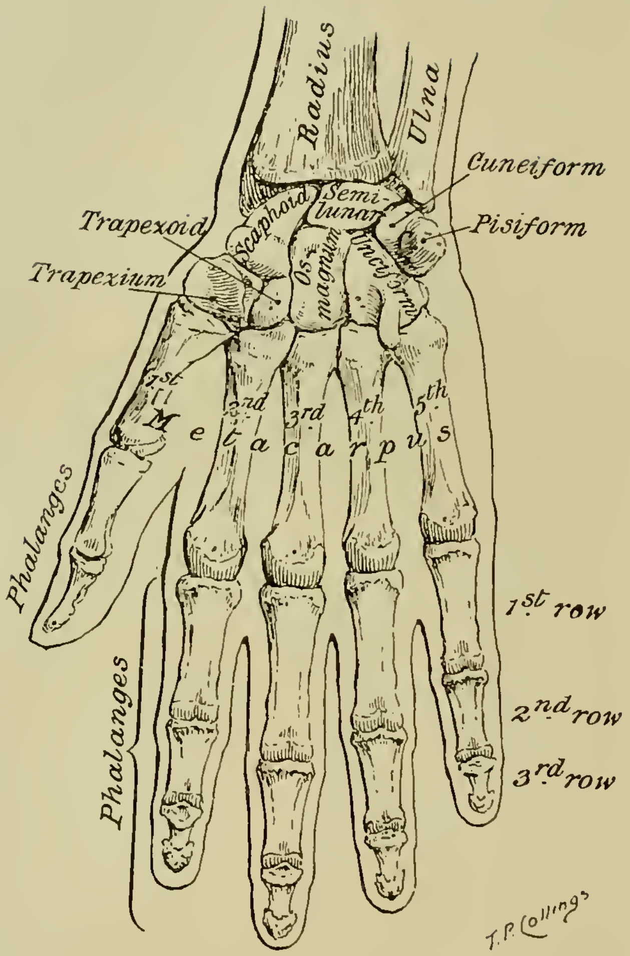

PLATE VIII.

Palmar Surface of Right Hand, showing the Bones of the Carpus.

Industrial Diseases and Accidents.

ABDOMEN.—The belly. It consists of a cavity containing stomach, bowels, liver, spleen, bladder, kidneys, abdominal artery (aorta) and bloodvessels coming from it, nerves, &c. The cavity is enclosed by walls made up of skin and muscles, vertebral column and upper (iliac) portions of haunch bones (innominate bones). The internal surface of the walls is lined with a thin, delicate membrane, the peritoneum (q.v.). This membrane is continued over and invests the organs (stomach, bowels, &c.) in the cavity. The abdomen may be mapped into regions by certain lines marked on the skin. These are :—

Right hypochondriac (under right rib cartilage)	Epigastric (stomach)	Left hypochondriac (under left rib cartilage)
Right lumbar (right loin)	Umbilical (navel)	Left lumbar (left loin)
Right inguinal (right groin)	Hypogastric (under stomach just above genital organs)	Left inguinal (left groin)

The most common injuries to the abdomen are wounds (simple or perforating), contusions, rupture of muscles, burns and scalds. A simple, clean wound will be healed in from seven to fourteen days ; if it is extensive or becomes septic, as a consequence of dirt being introduced at the time of the injury or after, it will take much longer to heal. When the wound opens the abdominal cavity the outlook is extremely grave. If the patient escapes the immediate dangers of hæmorrhage or septic inflammation of the peritoneum (septic peritonitis) or injury to an internal organ, and healing takes place, there is risk of the scar yielding later on and a hernia occurring, a condition which is ameliorated by an abdominal supporting belt, but incurable without operation. Estimate of incapacity for work on account of a ventral hernia following injury, 50–60 per cent. (Rohmer, Ollive). Contusions of the muscular wall only; these usually get well in from four to six weeks. If the violence is great there will also most likely be a rupture of an internal organ—liver, kidney, stomach; under such circumstances life may be saved by early operation. If the injury falls short of causing rupture of an organ, local adhesive inflammation in the cavity may occur, gluing the organs together, and thus be the means of producing permanent ill-health. Rupture of a muscle will take quite six to eight weeks to unite; if extensive it may leave a weak scar, which will yield to the intra-abdominal pressure and produce a hernia somewhat similar to that following a penetrating wound. Burns or scalds, if they affect a wide area, are more than usually serious in this region on account of the shock and collapse which follows early and the septic absorption which occurs later.

ABORTION.—Expulsion of embryo before it is capable of living outside the womb. Pregnant women workers in lead are liable to abort.

ABSCESS.—A circumscribed collection of matter (pus), a result of inflammation. It may be acute (hot), chronic (cold), or follow direct or indirect injury. The course of an abscess may be simple, or the pus may burrow its way into areas remote from the point of origin; it may be absorbed, discharge itself, or be opened and heal up quickly, or result in an ulcer or a tortuous unhealed channel called a sinus. A virulent poison may have been introduced, and this, by ripening and maturing in the blood, may produce death by toxæmia, blood poisoning. (*See* **Septicæmia.**)

ACETABULUM.—The cup-shaped hollow in the haunch bone (innominate) in which the head of the thigh bone (femur) fits and moves, forming the hip-joint. It requires enormous force to fracture, and is thus a very serious injury. (*See* **Pelvis.**)

ACETYLENE. (*See* **Carbide of Calcium.**)

ACNE.—A disease of the sebaceous, grease-secreting glands of the skin. A form of it, Acne Pilaris (Tar acne), attacks workers in pitch and tar. It consists of hard, red nodules with a black, tarry point in the centre. It may spread over hands, arms, thighs, and may become cancerous. Careful personal cleanliness is the best preventive. (*See* **Tar. Epithelioma.**) A. Rosacea is another form of acne ; also called " Brandy face," " Beer blossom," unchristian names suggesting, not always correctly, a too free use of stimulants.

ACTINOMYCOSIS.—A chronic infectious disease of domestic animals caused by the ray fungus, and communicable to man. The usual mode of entrance is by food stuffs—grain, barley, rye. The mouth is most often attacked ; " lumpy jaw " is a name given to this localised condition. A particle of infected cereal may penetrate the skin or enter a wound and produce the disease. The patient suffers from loss of weight and strength, and is usually feverish. There is a discharge of pus from the wound, in which the fungus may be detected. A serious disease if not discovered early, and found amenable to thorough operative removal.

ADDISON'S DISEASE.—A disease affecting the functions of the suprarenal bodies (bodies closely in contact with the kidneys). It is recognised by bronzing of the skin, vomiting, diarrhœa, emaciation. It is a fatal disorder. Borrmann (Sand) relates a case in *Deutsches Arch. f. klin. Medic.*, 1906, lxxxvi, which followed local injury. Rolleston also is of opinion that the disease may arise from traumatism. Osler states that injuries, such as a blow on the abdomen or back and caries of the spine, have in many cases preceded the attack.

I have seen a case of this disease in which an injury accelerated the exodus.

ADHESIONS.—The sticking together of parts which should normally move freely on each other. It occurs in joints after injury or tuberculous or other inflammation, and in the chest following pleurisy ; blows or squeezes of the abdomen, if not fatal, may produce localised inflammation and consequent sticking together of organs, seriously interfering with their normal working. An intestinal adhesion may seal up a rent in the gut ; this may get quite well or break down and allow leakage later. (*See* **Joint. Pleura. Peritonitis.**)

AGE.—The influence which age has in the matter of recovery after injuries is considerable. It is well known that fractures and wounds do not become repaired as rapidly in the aged as in the more youthful, and it is also commonly observed that an injury or an illness hastens the breaking-up of a constitution which under ordinary circumstances would bear normal wear and tear for some years. On the point Bailey states : " Age is important both in causation and prognosis. After fifty years there is less effort at repair, and injuries may bring to light diseases hitherto dormant. Age is determined not only by years, but by the general condition of the patient. ' A man is as old as his arteries.' In the aged the so-called functional symptoms are of more serious significance than in the young." On the other hand, youth, whilst favoured in many respects, is somewhat predisposed to acquire certain diseases, such as consumption, lead poisoning, &c. (*See* **Arterio sclerosis. Insanity. Senility.**)

ALBUMIN.—A nitrogenised non-crystallisable substance, found as an abnormal constituent of the urine (albuminuria), in certain recognised diseases, and after injuries to the kidneys, sometimes after injuries to the liver. It is discovered by chemical examination. Certain drugs, such as balsam of tolu, copaiba, santal oil, when taken into the system, cause a like reaction in the urine. Tests will settle this problem. White of egg, which contains 20 per cent. albumin, has been known to be added to the urine for the fraudulent purpose of simulating albuminuria. Sand gives a simple method of recognition: egg albumin added to urine coagulates by heat in a single tuft which sticks to the test-tube wall, whilst in genuine albuminuria non-adherent clouds form. (*See* **Bright's Disease. Kidney.**)

ALCOHOLISM.—Excessive indulgence in alcoholic stimulants produces serious effects in workmen as in other classes; even a comparatively slight injury in an alcoholic subject may cause the development of delirium tremens and subsequent death. Oliver states that "the excessive use of alcohol is a cause of epileptic attacks in men previously free from fits, and as epilepsy assumes many forms—for example, often only a sense of giddiness or faintness—it is not impossible that some of the unexplained falls of men, which result in serious injury to life and limb, may be the result of ill-nourished, poisoned conditions of the nervous system, not the outcome of an immediate debauch, but of long-continued indulgence in alcohol." He also states that "an intemperate man is only courting disaster when he continues to work, for example, in a white lead factory." Wounds in chronic alcoholics heal slowly, and they are frequently complicated by blood poisoning and mortification. Amongst the symptoms and signs of chronic alcoholism are found: acne rosacea, attacks of delirium tremens, mental sluggishness, arterio sclerosis (q.v.), impaired memory, tremor, irritability, indigestion, furred tongue and offensive breath, constipation, enlarged and later, hobnailed liver, dropsy.

AMBULANT.—Walking. It is applied to forms of certain diseases in which the indisposition is such as to permit the patient, though definitely in the grip of the disease, to walk about. The term also refers to a treatment of fractures of the lower limbs by means of a special pattern of splint which enables the patient to walk.

ANALGESIA.—Painlessness, loss of sensibility to painful stimuli. It is present in hysteria, compression of the spinal cord, in syphilitic and other non-traumatic diseases of the spinal cord. It may be simulated, but this can usually be detected by electrical or other methods. (*See* **Anæsthesia. Malingering.**)

ANÆMIA.—A condition of poverty of blood, evidenced by pallor of the skin and gums, lips, &c., general weakness. It may arise spontaneously as splenic (*see* **Leucæmia**) and pernicious anæmia, chlorosis, &c., or follow injury and be due to direct loss of blood. It is a characteristic symptom of anchylostomiasis (q.v.), workers in excessive heat (Oliver), lead poisoning. (**Pernicious anæmia** is a fatal disease of the blood of unknown causation. **Chlorosis** is an anæmia of young girls.)

ANÆSTHESIA.—Loss of feeling, insensibility, may be produced by functional or organic disease. It is present as a symptom in diseases of the brain, such as hemiplegia (paralysis of one side of the body), disease of posterior part of spinal cord, locomotor ataxia, neuritis, traumatic neurosis, hysteria, section of nerve.

Hemianæsthesia is loss of feeling in one half of the body. It is usually hysterical if found alone. (*See* **Malingering.**)

Chloroform and **Ether** are used to put the subject to sleep for the purpose of making an examination into the condition of an anchylosis, paralysis, &c. It frequently takes from ten to twenty minutes or more to get the full effect of the drug, and during the earlier periods of this time considerable excitement is often manifested, with strong movements and free flexions of limbs and joints which have been alleged to be weak, paralysed or immovable. When the full effect of the drug takes place a more detailed and extensive examination can be made. General anæsthesia is also induced by the introduction of other drugs into the body, such as ethyl chloride, nitrous oxide gas, &c., and localised anæsthesia by injections of morphia, cocaine, stovaine, &c., to allow of the painless performance of surgical operations. (*See* **Operation.**)

ANCHYLOSIS.—Fixation of a joint. The union of the structures in, or the thickening or spasm of parts about a joint, preventing its full use. Such a condition may follow injury or disease. It may be temporary or permanent, partial or complete, simulated or exaggerated. Radiography will usually display bony irregularity or obstruction if present. Genuine anchylosis is accompanied by wasting of muscles beyond that due to disuse. If simulation or exaggeration is suspected, the use of an Esmarch rubber bandage tightly placed round a limb has been recommended to produce fatigue of the muscles used to resist the observer. This, when removed after a few minutes, may have as a result a marked diminution of the resistance if simulation is present. A general anæsthetic is also of great use. But these tests are not infallible, and under either or both a spasmodic anchylosis may diminish or disappear. A spasmodic anchylosis may occur in acute inflammatory disease of a joint, in organic disease of the nervous system, or in hysteria. A grating sound may be heard in many of these cases of partial anchylosis, and in arthritis. Heller (Sand) states that he found this grating in 9.5 per cent. of normal shoulder-joints, and in 20.5 per cent. of normal knee-joints. (*See* **Crepitus.**)

ANEURISM.—A sac containing blood and communicating with the interior of an artery. The sac may be composed of one, or more, or none of the walls of the artery, the blood pressure having produced more or less destruction of walls which were already diseased or injured, and consequently so weakened as to be unable to withstand the pressure. A cut or a contusion on a healthy artery may have an aneurism as a late result. " The aneurismal tumour does not appear immediately after the accident, but at a time varying from five months to five and a half years. Aneurism of the arch of the aorta has brought on death in eighteen months." (Rohmer.) A severe strain, a blow, or a fall may bring on an aneurism of the aorta, particularly in persons suffering from disease in the arteries (arterio-sclerosis (q.v.) or syphilis). It may also aggravate the disease. Injuries may also cause the tumour to rupture. In such a case, if the aneurism is superficial and prompt treatment applied, life may be saved ; if the rupture is on the course of the abdominal or thoracic aorta, then death will rapidly ensue as a rule, but persons have been known to walk about with a leaking aortic aneurism. Severe wrenches of the limbs in cases where the arteries are diseased, and possibly in healthy vessels, will cause rupture of a coat or coats, or an embolism, and the subsequent yielding under blood pressure results in an aneurism. Defective development may also play a causative part, as aneurisms have been encountered in early life, even at birth. Aneurisms may arise in any of the arteries without being in any way related to injuries, and in their early stages may not cause any symptoms. The tumour is very frequently seen to be pulsating, but if deeply situated an X-ray examination may be required to discover it. Aneurism of the arteries in the chest or abdomen totally incapacitates for work ; in other situations the incapacity is from two-thirds to three-fourths (Rohmer).

ANGINA PECTORIS.—A disease marked by a sudden, acute, suffocating pain in the chest. It may be associated with aneurism of the thoracic aorta or disease of the heart. Butler states that with very rare exceptions it is associated with arterio-sclerosis, and that the exciting causes of an attack are muscular exertion, strong mental emotion, gastric disturbance or distension, exposure to cold. It usually affects men over forty. A false or pseudo-angina is described as due to neurasthenia, over-use of tea, coffee and tobacco, spasm of the blood vessels. In true angina the outlook is grave; in pseudo-angina favourable.

ANILISM.—Poisoning by anilin. (*See also* **Benzine.**) Anilin is used in the dyeing of certain cotton goods. The absorption of the poison causes headache, sickness, drowsiness, shortness of breath, palpitation of the heart, tingling in the extremities. Oliver states that these symptoms may not come on until the workmen have left the factory and reached home. He further states that anilin oil is used in the polish required for the brown and fawn-coloured boots and shoes sometimes affected nowadays, and that children out walking with their nurses have exhibited alarming symptoms traceable to the use of a boot polish containing anilin. Relm (*Berl. klin. Wchnschr.*, li, No. 19) has collected twenty-one cases of cancerous and papillomatous growths in the bladder in workers in anilin. Casper also supports this statement, and mentions other chemicals, such as fuchsin and toluidin. Scheduled.

ANKLE-JOINT.—The joint between the leg and foot, made up of the bones of the leg (tibia and fibula) and the astragalus, held in position by ligaments and tendons. Tailors' ankle is a condition developed in tailors due to pressure on the outer side of the ankle from sitting cross-legged. The most common injuries are associated with fractures of the lower end of the tibia and fibula and displacement of the foot outward and backward (Pott's fracture). Fracture of the malleoli, if comminuted, or if there is much displacement of the fragments, may be followed by anchylosis, more or less complete, and also by pain on movement, caused by excessive callus formation and its pressure on adjacent structures. The foot may also be forced upwards between the tibia and fibula (the latter still retaining its fixation to the astragalus), and constitute Dupuytren's fracture. Dislocations may occur, fractures of the bones of the foot, rupture of the Achilles tendon, sprains, usually accompanied by a fracture (often this cannot be discovered without X-ray examination). The fractures and dislocations may be compound or simple. If compound, there is considerable risk to the limb, and some risk to life. A simple dislocation will be reduced readily, and be well in about two months.

Subastragaloid Dislocation.—This is very rare. The astragalus remains in contact with the lower end of the tibia and fibula, but the calcaneum and scaphoid are separated from it. It may occur in an inward, outward, forward, or backward direction. It may be simple or compound. In simple dislocations the prognosis is usually favourable, the use of the foot being impaired for a time. In some cases reduction of the dislocation may be difficult or impossible without an operation, such as resection or removal of the astragalus. Even a severe operation of this kind may have as a result a good and useful, though weak, foot. In compound dislocations the risk is that of sepsis; but if the patient escapes this and reduction is achieved, full use of the foot will follow in most cases.

The fractures known by the names of Pott and Dupuytren are very severe injuries. Recovery is slow, and sometimes results in deformity and permanent disability in the use of the foot. If the foot becomes fixed at a right angle to the leg, or if there is a little movement, the incapacity is not so very great—15 to 20 per cent., according to the nature of the work, the higher figure applying to those who require the free and untrammelled use of the lower limbs

(Brouardel) ; but if the foot becomes fixed in an extended or acutely flexed position the incapacity is great, and may be esitmated at from 10 to 60 per cent. (Brouardel) or 50 per cent. (Rohmer). The younger the patient the better is the chance of his being able to return to full work.

Rupture of the Achilles tendon (heel-bone tendon) will require operative treatment, and usually be well in three or four months.

ANKYLOSTOMIASIS.—Also called Uncinariasis, Dochmiasis, Hookworm disease, Worm disease, Miners' anæmia, Tunnel anæmia. A disease caused by the presence, mostly in the upper portion of the small bowel, of a worm called *Ankylostomum duodenale.* The worm measures from 8 to 10 mm. in length, the female being somewhat the larger of the two. The worms when passed are white in colour if alive, grey if dead ; some are reddish, due to the blood which they have sucked from their host. Large quantities of eggs are produced by the female ; the eggs measure .056 to .061 mm. in length, and are twice as long as broad. They are symmetrical and oval, and hatch in about three days after being passed. The larvæ gain entrance into the human body through water or through food, or by means of unwashed, infected hands ; they can also pass through the skin into the blood stream, and thence into lungs, gullet, and finally rest in the gut. When in the skin they are known amongst tin miners by the name of "bunches."

The symptoms are profound anæmia, swelling of face and limbs, and great weakness. The disease is generally epidemic, death frequently ensuing if it is not recognised and treated early. The diagnosis is made from the presence of the ova in the stools.

As to prevention, Oliver states that water-closets should be provided for the men at the pit mouth. In infected mines portable day closets or covered pails should be installed for use underground, and the deposition of fæces elsewhere should be punishable. The spraying of the workings with strong salt solution is also advised. Scheduled.

ANTHRACOSIS.—Miners' lung. A condition of the lungs due to the presence of coal-dust. The lung, as a rule, is very tolerant of this foreign material, but a serious disease known as miners' phthisis may occasionally ensue. Owing to improved conditions of working underground, this disease is not nearly so prevalent as it formerly was. (*See* **Phthisis.**)

ANTHRAX.—Woolsorters' disease, Splenic fever. An infectious disorder produced by the entrance into the body of the *Bacillus anthracis*. Animals get the disease mostly by means of infected food. The hair and hides of these animals contain the germs, and if workmen handle these they are very likely to become inoculated. Dust laden with the spores (seeds), if breathed, may convey the disease into the lungs. Butchers, workers in wool, bone manure workers, &c., are the persons who most frequently suffer. At the point of inoculation a hard red boil appears, and from this the germs make an entrance into the system. If the disease is recognised early and the boil excised, the infection of the general system may be prevented. The diagnosis ought to be supported by a bacteriological investigation of the material on which the sick workman had worked, and also of the fluid from the boil, or the blood. When the bacillus gains an entrance into the lungs the outlook is very unfavourable. The anti-anthrax serum introduced by Sclavo, of Milan, appears to be a remedy of great value. The preventive measures consist in thorough disinfection of all foreign hair, wool, &c., before being distributed to workmen. Scheduled.

AORTA.—The large, arterial, main conduit which springs directly from the left side of the heart and conveys the blood to smaller vessels, and thence to all parts of the body. The part of this conduit which extends to the diaphragm (midriff) is known as the thoracic aorta ; from the midriff down to about opposite the navel it is called the abdominal aorta.

Cases of acute inflammation of the aorta, due to injury, have been recorded by Benedikt and Vibert (Sand). Aneurisms of the aorta may follow injuries. " A dissecting aneurism (one in which the coats of the vessel are separated) and a true aneurism (one composed of at least a single unbroken coat) form, in the great majority of cases, without the assistance of traumatism. The time which an aneurism takes to develop after injury is absolutely unknown ; one can only reason on the probabilities " (Thoinot). A case of aneurism of the arch of the aorta developing eight months after a violent contusion of the thorax has been observed by Merklen and Pouliot (Ollive and Le Meignen). A strain may also cause an aneurism of the aorta, especially if the vessel is diseased. Rupture of the aorta is immediately fatal, and is usually caused by severe crush of the chest wall or abdomen. Rupture of an aneurism of the aorta may occur after effort. It is hardly possible for complete rupture of a healthy aorta to be produced by effort. Aneurisms of the aorta occasion total incapacity. Aneurisms of the thoracic aorta outnumber those of the abdominal aorta by about 20 to 1 (Butler). (*See* **Aneurism.**)

APOPLEXY.—Rupture of a blood vessel on the brain or spinal cord, producing paresis, paralysis and sometimes loss of the power of speech (aphasia), loss of memory (amnesia). The rupture of a vessel on the left side of the brain causes paralysis or partial paralysis of the right side of the body ; the left side of the body is affected if the lesion is in the right brain. Such a condition may ensue from direct injury to the head (paralysis also follows injury to the spinal cord), the most common cause being rupture of small, previously existing aneurisms in the course of the arteries of the brain. Effort may play a part in causing rupture, but it ought to be very clearly established on good evidence before it is accepted. Certain events can favour congestion of the brain and thus determine a rupture, such as a sudden, abnormally severe, physical effort, a high temperature, sudden emotion, working in a stooping position. The apoplectic symptoms may be delayed for from several hours to several days after direct injury to the head, but more usually they appear immediately. It is also well to remember that a person the subject of a sudden attack of apoplexy may fall down and show evidences of injuries to the head, &c. These might erroneously be considered to be the primary cause of the apoplexy.

APPENDICITIS.—Inflammation of the vermiform appendix, the worm-like process attached to the beginning of the large bowel in man. It is situated in the right inguinal region of the abdomen, but it may be abnormally fixed in other places. The disease may arise from a blow (by far the largest number of cases arise spontaneously), a fall, &c., a sudden severe effort as in lifting. It frequently, but not always, starts immediately after the trauma ; the interval should not be longer than four days in a previously healthy person, unless there are distinct abdominal symptoms during an interval which persist up to the onset (Sand) ; there is nothing at all in the course of the illness to distinguish it from that arising in the usual way. It is hardly credible that the healthy appendix can be injured directly by anything but the greatest violence, violence which would produce damage to other organs as well. Neumann and Fürbringer believe that either a traumatism or intense effort may cause the intestinal contents to be forced into the appendix, and this being probably accompanied by rupture of the appendicular mucous membrane may set up appendicitis (Sand). Wohlgemuth, at the Berlin Medical Society (*Brit. Med. Jour.*, July 10th, 1909), related a case in which he believed a severe injury to the right abdomen set up localised peritonitis and consequent kinking of the appendix, which at the end of three months necessitated an operation for appendicitis. Ollive and Le Meignen state that there is no such thing as traumatic appendicitis, but that there is appendicitis aggravated by injury. In the fifty cases recorded by Kelly as following injury the appendix was found to have been either abnormal or diseased. It is quite clear that slight injury or strain can initiate a violent attack if the appendix is unhealthy. This unhealthy condition may have existed for a long time, and the proprietor be entirely unconscious of it. The operative treatment of appendicitis, if undertaken before grave complications ensue, is very successful. After a simple appendicectomy done in the quiescent stage, full working capacity will usually be complete in about two months. The article by Jeanbrau and Anglada in the *Revue de Chirurgie*, July, 1907, is a full study of this subject.

ARSENIC.—An irritant poison used in the manufacture of certain colours, such as Scheeles green or arsenite of copper. Workers in arsenic mines and at depositing tanks in copper works, tinning and bronzing workers, fur curers, &c., are liable to suffer. The arsenic acts as an irritant, and will produce inflammation and ulceration; it will cause vomiting if taken by the mouth, and pain, diarrhœa and collapse, the severity of these symptoms depending on the dose. Arseniuretted hydrogen gas is used in some works and it produces similar symptoms when inhaled. In the more chronic forms of poisoning peripheral neuritis occurs. This is shown by paralysis of the muscles, also irritation of the eyes and throat, colic, wasting, ulceration of the hands, and eruptions on the skin generally. The symptoms, even after an over-dose of the poison, may be considerably delayed in making their appearance. A fatal dose would be two or three grains, though one grain may be fatal. Scheduled.

ARTERIO-SCLEROSIS.—Atheroma. A circumscribed or diffuse thickening of the walls of an artery, secondary to inflammatory or degenerative disease. It is associated with certain diseases, such as gout, rheumatism, syphilis, Bright's disease, alcoholism, chronic lead poisoning. It may affect the young, but is met with mostly in later life, and it is a normal accompaniment of old age. It has a causal relation to aneurism (q.v.). (*See* **Age. Senility.**)

ARTHRITIS.—Inflammation of a joint may be due to injury, and to various diseases, such as rheumatism, gout, tubercle, gonorrhœa, blood poisoning (pyemia), &c. It is characterised by pain, swelling, redness, heat in the part, difficulty in the use of the joint, effusion of fluid or matter into the joint. It may be a local affection, or it may be a sign or a cause of serious disease of the general system. The condition may get quite well, or it may cause more or less complete interference with the functions of the joint. Muscular atrophy can follow arthritis, and is usually of very long duration. Quiet necrosis (q.v.) (Paget) (death of the bone) and deforming arthritis may ensue after injury, as also may tuberculous arthritis. In regard to this latter, Fenger (Hektoen) states that slight traumatism appears to be the starting-point in 56 per cent. of the cases. There is always combined with arthritis a certain amount of synovitis (inflammation of the synovial or lining membrane of a joint or tendon sheath). A simple arthritis will most probably be well in about six weeks. If there has been an effusion of blood into the joint, recovery will take at least three months ; and if pus forms life may be threatened, excision or amputation required, or the joint destroyed. Afterwards the usefulness of the joint will depend on the amount of destruction and the extent of the anchylosis, the weakness and relaxation of the supporting ligaments and muscles. (*See* **Anchylosis and Shoulder. Hip, &c. Joints. Kyphosis. Synovitis.**)

ASPHYXIA.—Suffocation, deprivation of oxygen. It occurs in poisoning by certain gases, as carbon dioxide, &c., mechanical obstruction to air passages. There is in general, blueness or lividity of the body after death. The other *post-mortem* signs will vary according to the cause. There is also a local asphyxia, **Raynaud's disease.** The symptoms are numbness of two or three fingers; they feel dead, and there may be some anæsthesia. These may disappear, or the disease may progress and the fingers become blue, swollen and painful, and even gangrene take place. The gangrenous stage usually lasts about three weeks. This disease is long in its course, and is liable to recur, but most cases get well. It may be caused in predisposed subjects by fright and occupations that lead to exposure to severe weather conditions.

Traumatic Asphyxia.—A rare disorder, caused by injuries which produce continuous compression of the chest for some minutes, as in persons pinned under a wagon, falls of masonry, coal, &c., lift accidents. The face and neck of the patient becomes blue-black; the discoloration may extend to the upper ribs and to the arms. This sharply limited blueness is believed to be due to the fact that the facial and jugular veins have no valves, or these are incompetent, and consequently there is no check on the backward course of the blood produced by the compressing force on the chest (Perthes). The disease is dangerous, but a few cases recover. (*See* Beach and Cobb, *Annals of Surgery*, April, 1904; Despard, *Annals of Surgery*, June, 1909.)

ASTRAGALUS.—The bone of the foot which articulates with the tibia and fibula, forming with them the ankle-joint. It acts in the foot almost like the keystone of an arch. Dislocations occur, and they cannot always be replaced, and frequently require operative removal. If this be done the foot may be quite useful, but it is not able to bear heavy strains. Fractures are more frequent than dislocations, and if there is not much displacement of the fragments or much comminution the functional results may be fair If there is great displacement or comminution the fragments may require removal, and sometimes a more effective foot is obtained by this plan than by attempts to retain them. Frequently a great deal of pain on walking remains after injuries requiring removal of the whole or part of the astragalus, causing incapacity equivalent to loss of the foot. (*See* **Ankle. Foot.**)

ATROPHY.—Wasting of an organ or part. It may be caused by disease or injury to the central nervous system, or local disease or injury. The condition is objective in muscles ; it may be measured, and under certain circumstances can be demonstrated by electrical methods. Bailey states that, contrary to general impression, there is very little difference in the measurements of normal persons on the two sides, that persons who do heavy work with one arm only show slight increase. Hitchcock (Bailey) measured 4,890 students, and found that the right arm is only 7 mm. (¼-inch) larger than the left. The right forearm has the same increase ; the right thigh is 3.3 mm. (⅛-inch) larger than the left. Between right and left calf there is practically no difference, 1 mm. ; this difference may be slightly increased in persons who do heavy work with one arm or leg. Bailey further states that disuse of a limb from any cause may bring about slight wasting, but that this does not usually exceed ¼ inch for the arm and ½ inch for the thigh. Atrophy in hemiplegia following apoplexy is also very slight. After injury to joints an atrophy may ensue, more marked than the atrophy of disuse, and evidently due to some trophic (nutritional) disturbance in the muscles. The muscles situated centrally to the joint are commonly affected, though the whole limb may atrophy. The knee-joint is often affected in this way, recovery being slow. I am in agreement with these views, for my own experience leads me to believe that the atrophy in muscles in the neighbourhood of injured and contused joints is in many cases far beyond that which is to be expected from disuse. This is the more noticeable now that most of these cases have early systematic massage as an item in treatment, and consequently the muscles are not permitted to lie dormant. (*See* **Knee-Joint. Shoulder.**)

Atrophy of Muscle and Nerve; Reaction of Degeneration (R.D.).—The usual electrical reactions which occur in healthy nerves and muscles are as follows: With the poles of the faradic battery applied there is a strong or weak contraction according to the strength or weakness of the current passing. Owing to the alternating nature of the faradic current it is not practicable to consider if the poles are negative (K. = Kathode) or positive (An. = Anode). In using the galvanic battery attention must be paid to the poles. Normally healthy nerves and muscles react more to the negative pole (K.). Here is the normal human contraction law formula. With a weak galvanic current the kathode pole on the part to be tested, the other pole on say the chest, we see when the circuit is closed, that is the moment the current is turned on, a contraction—kathodal closure contraction=K.C.C. With a somewhat stronger current we get a stronger K.C.C. Now if by means of the pole changer we make the previous kathode pole into an anode or positive pole (An.) and close the circuit, we get an anodal closure contraction (An.C.C.). With this current still running, if we suddenly open the circuit we get another contraction, an anodal opening contraction (An.O.C.). With a still stronger current, if we make the poles as they were when the weak current was used—that is, the kathode pole on the tested part—we get a kathodal closure tetanus (K.C.Te.). If we change the poles again we now get a stronger An.C.C., also An.O.C. If we reverse the poles once more, still with this strong current running, we may get a kathodal opening contraction (K.O.C.), the complete formula being :—

(1) Weak current, K.C.C.
(2) Stronger current, K.C.C., An.C.C., An.O.C.
(3) Still stronger current, K.C.Te., An.C.C., An.O.C. K.O.C.

In some cases the An.O.C. may occur sooner than An.C.C.; rarely in the facial, ulnar, peroneal and median nerve territories, frequently in the musculo-spiral (Jacoby). The reaction of degeneration (R.D.) depends on the changes which occur in nerve muscular apparatus which has been severed by injury or disease from its nutritional nerve centres in the cord. The injury (or disease) may be in the nerve or in the centre. Within three to five days after a spinal nerve has been cut off from the cord it is less sensitive to faradic and galvanic currents; it may refuse to respond to faradism. In about ten to fourteen days it may be more sensitive to galvanism, and now show peculiar changes to the galvanic poles. An.C.C. may be greater than K.C.C., and, what is most important, the muscle contractions are slow and lazy. Later there is no reaction to faradism; finally, no reaction to either current. If the muscles and nerves recover the reaction begins to return to normal.

R.D., then, is no response to faradic current. With the galvanic current a sluggish, lazy contraction and as good or even better reaction to the positive (An.) than to the negative (K.) poles.

AUDITORY NERVE (Eighth Nerve).—It comes by two roots from the floor of the 4th ventricle of the brain, and between the pons and restiform body. It enters the internal auditory meatus with the facial nerve, and is distributed to the hearing apparatus. It may be injured in fractures of the base of the skull. Total deafness may result. (*See* **Deafness. Vertigo.**)

BACK: Backbone, Spinal Column or Vertebral Column.—Consists of a series of superimposed bones strongly joined together by ligaments, cartilages and joints; each bone (vertebra) consists of a body (in front), two lateral processes, and a posterior spinous process, so disposed as to have an aperture more or less circular; by the superposition of these apertures a canal, the spinal canal, is formed, in which hangs vertically the spinal cord. The nerves for the limbs and trunk given off from the spinal cord escape from the spinal canal by apertures (foramina) in or between the vertebræ. The vertebræ vary in shape, and five regions are distinguished: Neck (cervical, seven), chest (thoracic or dorsal, twelve), loins (lumbar, five; sacral, five; and coccygeal, four). Between the bodies of the vertebræ are discs of cartilage (vertebral cartilages) which, while uniting one vertebra to those above and below, allow a certain amount of play. The freedom of movement, which is chiefly forward, from side to side, and rotational, is greater in the neck than in the loins, and in the loins than in the chest. The sacral vertebræ are fused together into a solid, wedge-shaped bone, the sacrum, which forms the back part of the pelvis (q.v.).

The uppermost or first cervical vertebra (atlas), upon which the head rests, has no body, but revolves freely upon a pin projecting upwards from the second cervical vertebra (axis). The visible bony knobs in the back are the posterior spinous processes; that of the lowest cervical vertebra usually projects more than the others (vertebra prominens), and is frequently used as a convenient point from which to make measurements. The solidity of the spinal column is increased by strong ligaments, and by powerful muscles which both move and support it; in every attitude except complete recumbency these muscles are more or less in action. The lowest (coccygeal) vertebræ are fused into a small, wedge-shaped bone, the coccyx, which curves forward, its tip being near the anus; injury of the coccyx may be followed by a neuralgic affection, coccydynia. If this disease is persistent and incapacitating, relief may be obtained by the operation of removal of the coccyx.

Injury or disease may affect any of the component parts. Injury may be direct, indirect; intense muscular effort can determine a fracture. Contusions and twists may produce a sinking-in of the discs, causing pain and motor troubles. Other disorders and diseases which may follow injury to the vertebral column and spinal cord are concussion, contusion, hæmorrhage into the cord, fracture, dislocation (broken back, fractured spine), bringing in its train paralysis with its attendant and often incurable miseries. Injuries may set up acute or chronic inflammatory disease in the periosteum or bone itself, or in the joints or cartilage ; abscess, tuberculosis or tumours may develop there. As a sequence to these there may be pressure, softening or damage to the cord and its membranes, a curvature of the column or an anchylosis. The anchylosis may be bony and be closely related to deforming arthritis affecting the vertebræ (spondylitis deformans), or it may be fibrous. There may also be spasm of the muscles, which in general will be an indication of a disorder simple or serious.

Backache: Weak back, Injured back, Miners' back, Lumbago, Traumatic lumbago.—This pain in the back may be an expression of a constitutional disease, such as rheumatism, lumbago, influenza, fevers, disease of the kidneys, neurasthenia, &c., or it may point to disease or injury locally. Backache may be simulated or exaggerated. Pain in the back without any allegation of an injury in that region is a characteristic symptom of neurasthenia (q.v.), and in this relation it is a genuine manifestation of nervous exhaustion and fatigue. Frequently railway collisions and similar accidents cause strain of the spinal ligaments and muscles, so that in such cases we have fright and an amount of physical damage providing the symptoms so well known by the name Railway spine, Railway brain, Traumatic neuroses, Traumatic neurasthenia, Erichsen's disease, &c. Nevertheless, though the disease is not common, we may have a distinct clinical picture of traumatic neurasthenia without the slightest objective sign of injury to the back ; but in most cases there are points of tenderness to touch along the spine, and it is quite customary to find that these sensitive points have changed their position from day to day. In addition, there may be mental disturbance, sensory and motor symptoms, and whilst many get well after settlement of litigation, some get worse.

Miners' back is an ache of a not very severe kind in the lower part of the spine due to working in an attitude which puts some strain on the joints, ligaments and muscles of the back. Other workers, if their duties require standing and bending the back for a time sometimes get a sharp pain in the lumbar region at the moment when they come to straighten the back. The condition is troublesome, but rarely incapacitating.

Backache due to actual sprain of the vertebral column —**Traumatic lumbago**—is a definitely recognised disorder. It occurs after twists or wrenches of the column, as may happen in railway accidents, forcible flexion of the spine, after blows or falls on the back, lifting or holding up heavy weights. The symptoms may appear immediately, or be delayed for several days. The pain is very severe, even slight movements of the body producing exacerbations. The patient usually becomes a much-examined individual, and has a morbid dread of the pain (algophobia) ; he frequently complains before he is touched by the medical examiner. There may be evidence of effusion of blood in the muscles of the back, or adhesions of muscles or tendons. The attitude is often characteristic—body bent somewhat forward, back muscles in a state of spasm, slow, hesitating walk. There may be loss of sleep and other symptoms of nerve exhaustion. The duration of the disease is variable. The intense pain begins to diminish in about six weeks ; the back will usually be sensitive for twelve months or more, this depending on the severity of the original injury.

A distinction is to be drawn between this and the ordinary **Rheumatic lumbago,** and the history of the injury ought to be very clear before making a diagnosis of traumatic lumbago. Ordinary lumbago is common, traumatic lumbago is uncommon ; ordinary lumbago yields to anti-rheumatic remedies, traumatic does not. The development of the rheumatic variety may be accelerated by even slight injury, whilst considerable violence is required to produce the traumatic kind. The rheumatic is of brief duration, but frequently recurs ; the traumatic lasts much longer, and may, according to its severity, produce complete or partial incapacity for twelve months, or even more. The question as to whether there may be simulation arises in these cases of injured backs. Each case requires most careful examination, reviewing the history of the alleged injury, and making a thorough analysis of the various natural courses of pain in the back. Pain being a subjective symptom requires special consideration. The signs of Mannkopff and Bechterew—which have as an underlying principle the conversion of the subjective *symptoms* of pain into the objective *signs* of it—have great value if positive. The sign of Muller—depending on the law of Weber, which indicates the least distance at which two points of a pair of compasses could be separately distinguished by the subject—is also of value. (*See* **Malingering. Neurasthenia.**)

BEAT ELBOW, BEAT KNEE, BEAT HAND.—The first two are an inflammation occurring in the pouches situated under the skin at the tip of the elbow and over the knee-cap (patella) respectively. These pouches (bursæ) are not noticeable normally. They contain just a little lubricating fluid, and act somewhat in the manner of protecting buffers. They may become acutely inflamed, and suppurate on account of injury. Miners are specially liable to this trouble. The suppuration may be confined to the bursa, or it may set up serious constitutional disturbance, blood poisoning. If it remains localised recovery usually takes place under treatment in about two months. **Beat hand** is an inflammatory, suppurating affection of the layers of the skin of the palmar surface of the hand. It often occurs in colliers, and is caused by the position of the pick in the hand, which produces an abrasion, permitting the entrance of dirt and the consequent development of septic cellulitis. It is a painful affection, but is usually relieved in about six weeks. If it has spread into the hand and wrist there may be deformity from chronic contracture, and the usefulness of the hand becomes diminished. Scheduled diseases. (*See* **Cellulitis. Dupuytren's Contraction. Hand.**)

BENZENE.—An inflammable liquid used in the dry cleaning of clothes. The vapour produces symptoms when inhaled, such as intoxication, headache, vomiting. If the dose is large there may be loss of power in the limbs, alteration in the gait, called "steppage," difficulty of speech, loss of memory, hallucinations, mental depression, blindness. There are few cases of death from benzene poisoning on record. Santesson, of Stockholm (Oliver), found, *post-mortem*, fatty degeneration of heart, liver, kidneys and small blood-vessels.

NITRO BENZENE one of the derivatives of benzene, has the odour of bitter almonds, and is made use of in the manufacture of perfumery and in cooking, as well as in making anilin. The symptoms of acute poisoning are attacks of giddiness, loss of consciousness, blueness of the face, cyanosis. The chronic form is shown by anæmia, muscular pains, fatigue, drowsiness. The urine is dark, and will contain traces of the poison.

There are three varieties of DINITRO-BENZENE. It is light yellow in colour, and used in the preparation of such explosives as roburite and sicherit. It is more poisonous to workmen than ANILIN (q.v.) (amido-benzene). The symptoms produced are blueness of face and lips, breathlessness, giddiness, sleeplessness, pain and tingling in limbs, considerable diminution of vision ; in severe cases there may be great wasting of muscles of hand and fingers. The red corpuscles of the blood are seriously interfered with in all cases of benzene poisoning.

Colliers and others using explosives containing any of these compounds for blasting purposes in ill-ventilated places may exhibit slight symptoms of poisoning.

Scheduled as poisoning by nitro- and amido-derivatives of benzene (dinitro-benzol, anilin, and others) or its sequelæ.

BICEPS.—**Biceps Muscle of arm** arises by two heads from the margin of the glenoid cavity and coracoid process of the scapula (shoulder-blade), and is inserted by a single tendon into the tubercle of radius and the fascia of forearm. Its nerve supply is the musculo-cutaneous from the outer cord of brachial plexus. This muscle flexes and supinates the forearm, and flexes and adducts the arm. (*See* **Shoulder. Tendon.**) **Biceps Muscle of thigh** arises also by two heads, one from the tuberosity of the haunch bone, the other from the linea aspera of the femur. It is inserted by a single tendon into head of fibula. The nerve supply is from the great sciatic. It is one of the ham-string muscles, and it flexes and rotates the knee outwards and extends the thigh.

These muscles may be ruptured by a severe effort, or by a crushing violence ; this causes considerable incapacity. Good results may usually be expected from the operation of suturing the ruptured portions if the violence has not been so great as to produce extensive destruction of tissue. If the condition is such as to permit of early operation, the result will probably be very good. An operation when the muscles have atrophied will generally be of no avail. (*See* **Muscle.**)

BLADDER.—The term usually refers to the large hollow viscus which holds the urine or the small receptacle which holds the bile. Rupture of these organs may occur from direct violence, but are often associated with other severe and dangerous injuries to the abdomen and pelvis. If uncomplicated by other injuries, and if the rupture can be diagnosed very early, operation affords a hope of rescue. Malignant disease of the bladder is said to occur with undue frequency in anilin workers. (*See* **Anilism.**)

BLANKET STOVING.—The process of bleaching blankets by means of the fumes of sulphur. The work is carried on in winter time in a stoving house, and the workers suffer from an irritating cough. They are said to be immune from tuberculosis and infectious disease, though they are subject to chronic bronchitis. Oliver believes that, taking the work generally, it cannot be said to shorten life, since the average age at death is 64.1. Efficient ventilation is the important point in diminishing any ill-effects.

BLEEDER.—One who bleeds readily on the slightest injury ; a person who is a subject of the congenital predisposition to bleed ; also called hæmophilia. The causes are unknown. The condition cannot be diagnosed beforehand. A tendency to excessive bleeding controlled with difficulty is also associated with certain diseases of the blood as a secondary manifestation, notably in leucæmia, phosphorus poisoning, &c. It is disclosed by the uncontrollable character of the bleeding after even small injuries or operations, slight cuts, teeth extracted in the most careful manner, opening of abscesses, &c., and after trivial surgical procedures. It may be difficult or impossible to stop the hæmorrhage, and a fatal issue may ensue.

BLOOD.—The red fluid pumped by the heart to all the tissues of the body. The blood in the arteries is bright red ; that in the veins is much darker. It is compounded of a clear fluid, the plasma, in which is suspended the white and red corpuscles. The red corpuscles, to which the colour of the blood is due, are bi-concave discs, which carry the necessary oxygen from the lungs to the tissues. They number 5,000,000 per cubic millimetre in men, rather less in women. The white corpuscles, or leucocytes, are nearly spherical masses of protoplasm ; there are several varieties, each having a separate name. The proportion of white to red is usually about one white corpuscle to 500 or 600 red ; 5,000 to 10,000 whites per cubic millimetre are normal limits. There are also present in the blood a number of small colourless elements, oval in shape generally ; they appear in masses or bunches like grapes; they number about 200,000 to 300,000 per cubic millimetre (the blood platelets). The number of white corpuscles may be enormously increased in certain diseases, such as leucæmia (130,000 per cubic millimetre). A count of the red corpuscles can be a means of diagnosing a considerable loss of blood. Cabot records a case of rupture of the urethra with severe hæmorrhage. A count showed reds diminished to 3,304,000, whites 10,000. I have knowledge of a case of alleged "internal strain" which the subject stated caused him to bring up by the mouth and pass by the bowel quantities of blood. Examination showed a well-rounded, indeed fat man; the blood count, both red and white, normal. No person had actually seen the blood discharged, and the opinion expressed was that the disorder (?) was not an incapacitating one. The total amount of blood in the normal body is one-twelfth to one-fourteenth of the body weight. The specific gravity is 1055 to 1062 at 60° F.

The blood of various animals has been added to the sputum to simulate blood spitting (hæmoptysis), to vomited matter to simulate vomiting of blood (hæmatemesis). A microscopic examination of recent blood and careful observation of the subject will usually discover the fraud. In the camel tribe, and in birds, fishes and reptiles the red corpuscles are oval, and in the three races of animals last mentioned there is a central dark spot, the nucleus. The red corpuscles of the cat, pig or horse, sheep or goat are decidedly smaller than those of man; but the red corpuscles of the monkey, guinea-pig, hare and rabbit approach very nearly the size of the corpuscles of man. The serum test (Bordet, Uhlenhuth) is of some value in determining the presence of human blood. In this test human blood serum is injected at intervals into a rabbit. The suspected specimen is mixed with normal salt solution, and added to the serum of the injected rabbit. If human blood is present the mixture shows a cloudy precipitate after several hours.

The method of Marx and Ehrnrooth (Sand): Place on a glass slide a drop of the suspected mixture of blood (or a spot or clot dissolved in normal saline solution); the observer then pricks his finger, and places a drop of this blood on the slide at the side of the first. Mix the two with a glass rod for six or eight seconds; cover with another glass. If the fluid contains either the blood of man or a monkey, the red corpuscles pile themselves up like money columns; they hold their colouring matter, and their limits remain clearly defined. The blood of another species of animal shows the red corpuscles in irregular masses, the colour being discharged. These tests, whilst of service, cannot be absolutely relied on.

A malingerer may add his own blood, as in the case related by Ollivier (d'Angers), where the blood was obtained from either the arm, as shown by the scars, or from the nose by pricking the mucous membrane. (*See* **Hæmoptysis. Hæmatemesis.**)

BONE.—Fractures of bones are followed by the effusion of blood from the broken ends; this becomes, about the fourth and fifth days, vascular, formative tissue. It is produced mostly by the periosteum (the membrane covering bone). Some comes from the marrow, and also from the fragment ends. This formative tissue is called the callus, and at first it is soft. It envelops the broken ends, and at this stage it is named "provisional callus." It grows in amount until the fourth or fifth week, and at about the seventh week it becomes ossified, and is named "definitive callus"; then it is solid bone. It is large in quantity if there has been much comminution or great displacement of the fragments, and it may take months or years before the reconstructive and reparative processes are complete. If from various causes there is an absence of the callus, or if it does not become solid, we have the condition known as ununited fracture (false joint). Inflammatory disease of the bone (osteitis) or of its covering (periostitis), and abscess formation may be the result of injury. Necrosis (death of the bone *en masse*) and caries (molecular death of bone) may also follow. Tuberculous disease of bone is common, and may have an injury as an exciting cause. (*See* **Tuberculosis.**)

Tumours, sarcoma (a form of cancer) may follow injury. Carcinoma (cancer), if it occurs in bone, is believed to be secondary to a growth somewhere else.

Certain diseases, such as syphilis, tabes, carcinoma, sarcoma, &c., produce a fragility in bone. **Fragilitas ossium** is a condition of abnormal brittleness; its pathology is not well understood.

Atrophy of bone following injury has been described by Sudeck and others. This sets in from four months to several years after the injury.

Thiem has published a case of **traumatic osteo malacia** (a very serious disease, in which the bones become flexible and brittle) (*Osteomalacie nach Trauma Monatsschr f. Unfallheilk*, October, 1898, v., 10, pp. 308–313). Traumatic exostoses, or bony outgrowths, occur following injury; they may interfere with the use of a limb or joint or organ. They can usually be removed by operation. (*See* **Anchylosis. Fractures. Osteitis. Osteomyelitis. Periosteum.**)

BOWEL.—The long tube composed of three layers or coats, the external or peritoneal, middle or muscular, internal or mucous, extending from the lower aperture of the stomach to the anus. The first portion, the small intestine, twenty feet in length, is of small calibre; this portion ends in the large intestine at the right inguinal region of the abdomen. The large intestine is about five feet long, and ends in the rectum, which opens at the anus. The small may be the subject of inflammation (enteritis); inflammation of the large is called colitis. Tumours, tuberculosis, ulcers, &c., occur. Adhesions (q.v.) may occur after injury or diseases such as are before mentioned.

Blows on the abdominal wall may cause more or less severe damage to the bowel, and yet the skin of the abdomen may not show any evidence of the blow.

The small intestine is most frequently injured, the large one next in order, the rectum rarely. Injuries may take effect on the peritoneum (q.v.), parietal or visceral, or involve some or all of the walls of the tube. If the peritoneum lining the abdominal cavity is injured, the result is inflammation (peritonitis) (q.v.), which may resolve, or it may progress, and cause death from septicæmia; or, as is often the case when recovery follows, adhesions of a more or less extensive nature ensue. If the peritoneal covering of the tube is damaged the result may be rapidly fatal, or sufficient adhesive inflammation may be set up which mends the tube and prevents leaking; but this mend may become infected from the inside of the tube, and give way soon, or many days later, producing septic peritonitis and death. The injury may also take effect on the other walls of the tube, and cause contusion, with possibly subsequent gangrene, immediate complete rupture, or a perforation. Other conditions may arise, such as volvulus (q.v.) (twist), rare, invagination (intussusception (q.v.), telescoping of the gut). Rupture of the healthy bowel after a severe effort, as in lifting a heavy weight, is recorded by Moritz, Sterling, Stern (Thoinot). The presence of distension of the gut by gas or fæces favours rupture or twist if injury takes place. These conditions are extremely dangerous, and in the slighter injuries are difficult to diagnose. Spontaneous recovery may very occasionally take place in the less severe injuries, but usually operation is urgently required. The symptoms in most of these will be that of intestinal obstruction, peritonitis, blood may be passed per anum.

The duodenum is the first part of the small intestine in continuity with the stomach (twelve fingers' breadth, or ten inches in length). Ulcer of the duodenum may occur as the result of a direct blow or kick or compression between wagons, &c; effort has also been noted as a cause (Ollive and Le Meignen). (*See* **Stomach.**)

Superficial burns are sometimes followed by duodenal ulcer. Acute or chronic ulcer is a condition well known to arise without any relation to external violence, so that it is necessary, before coming to the conclusion that the ulcer has arisen as a consequence of the injury, to be very clear as to the traumatic cause, having regard to the possibility of a pre-existent ulcer. There can be no doubt that heavy lifting or straining has produced rupture of a gastric or duodenal ulcer and a fatal issue. (*See* **Stomach.**)

The late results of injuries to the bowel will have a relation to the amount of damage and consequent peritonitis caused by the original injury. Adhesions causing constant pain and chronic obstruction, or contraction of the lumen of the gut, are well-known sequelæ. These affections will, if they are at all distinctly manifested, produce permanent incapacity. They may or may not be amenable to surgical treatment. (*See* **Peritoneum. Peritonitis.**)

BOXWOOD.—(African.) Gonioma Kamassi. A species of timber from the Congo, Cameroons, &c., used in the manufacture of shuttles, &c. The wood contains an active poison, and the sawdust from the wood, if it settles on the skin, gives up its active principles to the sweat, and is absorbed (Harvey Gibson), causing the symptoms, sneezing, headache, sleepiness, faintness, sickness, and attacks of a kind of angina. Dixon believes that the effect is similar to that produced by the arrow poison, curare. The breath has a camphor-like smell. Death may ensue from exhaustion and heart failure. Scheduled.

BRACHIAL PLEXUS PALSY.—The brachial plexus is the great network of nerves at the root of the neck and under the clavicle. It is formed by the union and subsequent division of the lower four cervical and part of the anterior division of the first dorsal nerves. (The 5th and 6th cervical form an upper trunk, the 7th a middle trunk, the 8th and 1st dorsal the lower trunk.) It gives a nerve supply to the whole of the upper extremity.

Injuries to this plexus occur from wrenches of the arm, falls or blows on the shoulder region. Paralysis may be a complication of fracture of the clavicle, dislocations and fractures at the shoulder-joint. Traction, by tearing the nerve sheath, first described by Horsley, is the usual cause of the condition. The symptoms will depend on the number and extent of the trunks injured. There may be a total paralysis of the arm.

The **Musculo-Spiral** and the **Ulnar Nerves** (q.v.) are often involved together; so there will be drop wrist, inability to move little finger, and loss of writing movements in the fingers. The other nerves which may be involved are the circumflex, median, musculo-cutaneous, ulnar (q.v.).

Injuries to the neck, falls on the tip of the shoulder and dislocation may produce a condition known as

Erb's Paralysis or Palsy.—This is also an obstetrical palsy, as it may occur during difficult labour where manipulative interference is required. It is due to the necessary traction on the arm of the infant, producing strain on the 5th and 6th cervical nerve roots. The child usually grows up with an atrophied and deformed arm. The palsy affects the deltoid, biceps, brachialis anticus and supinator longus muscles; occasionally the supra- and infra-spinati muscles are also involved.

The symptoms are: the arm cannot be raised from the side, nor the forearm flexed or rotated fully out, the affected shoulder droops, and there may be partial dislocation. The muscles atrophy (q.v.), and there may be some numbness and tingling. The electrical reactions are altered; reaction of degeneration (q.v.) may be present.

Klumpke's Paralysis is a lower-arm type of palsy, following injuries to the shoulder involving the brachial plexus; the nerve root injured is the 1st dorsal. The small muscles of the hand are paralysed, and there is contraction of the pupil, sinking in of the eyeball, and flattening of the face. The eye symptoms are due to the connection of the 1st dorsal with the sympathetic nerve fibres for the eye and their implication in the trauma. In its pure form it is a rare affection, as the other nerves of the plexus are more frequently included by the accident. Recovery in brachial plexus injuries may take place eventually if the injury has taken effect below the clavicle; but if it has acted on the nerves above the clavicle the outlook is not so hopeful, even after operative suture or transplantation of nerve.

BRAIN.—The complicated mass of nerve matter encased within the skull. It consists of the large brain (cerebrum), the small brain (cerebellum), the bridge (pons) connecting the two former with the medulla oblongata, the upper and most vital portion of the spinal cord. Three membranes invest the brain and spinal cord. They are, from without inwards, the dura mater next the bone, the pia mater in contact with the brain, and between the two the arachnoid.

The organs are laved by a clear liquid, the cerebrospinal fluid. The functions of this fluid are believed to include regulating intracranial pressure and diminishing the effect of shocks. Injuries to the head causing fracture of the vault or base of the skull are serious in proportion to their extent, and also the danger to life will depend on the amount of damage to the brain. An important sign of fracture of the base is the leaking away of the cerebrospinal fluid through the ears.

Acute inflammation of the membranes (**Meningitis**) may occur after injury, and it is not necessary that there should be a fracture of the skull for this to happen. It usually comes on soon after the injury; but chronic meningitis may develop which produces symptoms not sufficient to prevent a man from working, yet later causing death, as in the recorded case of Erichsen three years after injury. The symptoms in the interval are usually headache, vertigo, sometimes epilepsy and paralysis, perhaps interference with vision amounting to blindness.

Tuberculous Meningitis, which is nearly always fatal, can be set up by injury. In this malady it is true that traumatism cannot create tuberculosis, but it may determine the meningeal localisation of a bacillus already present in the body. If there is a previous deposit of tubercle in the membranes or brain, traumatism could certainly expedite its development. (*See* **Tuberculosis.**)

A depressed fracture of the skull may produce symptoms which will depend on the depth of the depression, and also on whether or not the bone irritates or damages the structures underneath. (*See* **Epilepsy.**)

Injury may rupture one of the arteries of the brain or membranes, and the symptoms, which may develop only after an interval of some hours, will resemble an attack of apoplexy (q.v.).

Abscess of the brain (cerebral abscess) may be a sequence of head injury. It may follow soon after, and be a direct infection through, a wound or fracture, or it may develop without there being a lesion of the scalp or skull, Hirtz (Sand).

A cerebral abscess may become latent and not show any symptom for a very lengthened period (twenty-six years, Sand). Bullets sometimes become encysted and quiescent, giving rise to no further trouble. Abscess of the brain is most commonly a result of disease of the middle ear. This latter may possibly be caused by injury, but it is extremely rare.

Concussion of the brain is caused by blows or falls. It may be slight, in which the patient is merely dazed ; or severe, in which unconsciousness supervenes. In the former case recovery will rapidly ensue ; in the latter the immediate and late results will depend on the association of other injuries to the brain and membranes, such as laceration, contusion, fracture of base of skull—this is shown by bleeding from the ears and nose. Paralysis of one or more of the cranial nerves are signs of the gravest danger. (*See* **Concussion.**)

Persistent, severe, incapacitating symptoms may follow injuries to the head, such as headache, vomiting, epilepsy (most likely to follow compound or depressed fractures), vertigo, optic neuritis with subsequent blindness, mental symptoms, insanity, functional nervous disease (*see* **Back. Traumatic Neuroses**), neurasthenia, hysteria, &c., organic disease; tumour, sarcoma, carcinoma, glioma, cysts, paralysis. Possibly also injuries to the head may be an exciting cause of general paralysis (q.v.), more especially in syphilitics.

Porencephalus, a cavity or cyst-forming disorder of the brain, which is mostly of congenital origin (some cause which interferes with the maturation of the ovule—Hektoen, Riesman). In eleven cases of this disease recorded by Landouzy and Labbé, two in adults had a relation to fracture of the skull at the seat of injury. The symptoms may be delayed several years after the injury. They consist of epilepsy, hemiplegia, mental troubles (Ollive and Le Meignen).

Tumours of the brain.—The four most common forms are glioma, tubercle, gumma, sarcoma. The first and fourth are malignant growths; the second and third are due to infection by tuberculosis and syphilis respectively. Other forms are occasionally found. Hektoen and Riesman state, "An etiologic factor of brain tumour, the mode of operation of which can only be suspected, but which plays a most important *rôle* if we may judge from the frequency with which it has been noted to precede the occurrence of brain tumour, is trauma." (*See* **Cancer.**)

Hernia of the brain.—A protrusion of the brain through a breach in the bony skull, occurs after injuries which cause destruction of bone and dura mater.

The value of the incapacity of concussion of the brain, if followed by vertigo more or less frequent, persistent headache, neuralgia, and vomiting, is difficult to arrive at. Each case must be judged on its merits. It will frequently be as much as 83 per cent. (Rohmer); fracture of the skull without other serious consequence, adhesion of scar to bone and fracture of the frontal bone, 16⅔ per cent.; fracture which causes at times violent pain producing inability to work, 33⅓ per cent.; fracture of skull followed by epilepsy, 50–66⅔ per cent.; fracture with paralysis of right arm, 75 per cent.; fracture with paralysis of arm and right leg, 100 per cent.; weakness of memory and mind, 41⅔ per cent.; general weakness, unsteadiness of gait, loss of memory, impairment of mental faculties following fracture of the skull, 66⅔–100 per cent.; chronic incurable abscesses of brain, ill-temper, excitability, pain in the head, 33½ per cent.; incurable mental disease, 100 per cent.; paralysis of right or left side of the body following apoplexy, 83⅓–100 per cent.; difficulty in the movements of the body generally, 8⅓–16⅔ per cent. (Rohmer). (*See* **Head Injuries.**)

BRASSFOUNDERS' AGUE.—A disorder due to the inhalation of the fumes produced during the pouring of a molten alloy of zinc and copper into moulds. The symptoms are shivering, fever, sweating, headache and nausea. The attack usually lasts from one to two days, and affects new workmen or those who have been away from this work for some time. There is also a chronic condition of want of appetite, metallic taste in the mouth, colic, diarrhœa and tremor. There appears to be some liability to nervous affections. Bronchitis is frequently associated with these on account of the dusty nature of the work. It is not quite settled as to which of the two metals—the zinc or the copper—or whether it is the combination of both which is to be accused of causing the symptoms. The free use of milk is acknowledged to be curative as well as preventive.

BRIGHT'S DISEASE.—Nephritis, Albuminuria, Inflammation of the kidneys. It may be acute or chronic, and is usually characterised by more or less pain in the back, presence of blood or albumin (q.v.) in the urine, dropsy, &c. It is generally caused by exposure to cold and wet, fevers, alcohol, lead poisoning. Injury may set up such a condition. The trauma must be severe, and be such as to be followed immediately by blood in the urine, or other evidence of inflammatory or destructive trouble in the kidneys. A violent effort, by causing a tear of the kidney (Heusgen, Sand), may give rise to blood-casts in the urine and a nephritis, which may get well leaving no trace of damage ; but a subacute or chronic nephritis may ensue, producing the same amount of incapacity for work as chronic Bright's disease arising from ordinary causes. There can be no doubt that traumatism can aggravate a previously existing nephritis (Thoinot). (*See* **Kidney.**)

The cause of death is usually uræmia, the diseased organs permitting poisonous urinary constituents to enter the blood.

BRUIT.—The name applied to abnormal sounds heard over the heart, vessels and lungs, a murmur which may be indicative of functional or organic disease.

BUBO.—A swelling of glands. Usually applied to enlarged glands in the groin or axilla, caused by absorption of poisonous material from a wound, or by infection from gonorrhœa, chancroid or syphilis. One form of plague is characterised by the presence of buboes.

BURNS AND SCALDS.—Physical and chemical changes which result from the application of excessive heat. Three degrees of intensity are spoken of : the first, in which there is merely redness of the part ; the second, in which there is redness and also, in addition, blistering, vesication ; the third is that in which the tissues are destroyed (sloughing). Burns of the first degree may in the young cause death ; in the adult, if a large surface is involved there may be danger to life. In the second and third degrees the involvement of even small areas may be very serious. Mere reddening or a burn or scald of the first degree, if it extends over more than two-thirds of the body in an adult, may destroy life ; while one-third of the surface affected to the second or third degree will almost inevitably produce death (Fowler).

The part of the body injured will have a relation to the prognosis, the regions of the abdomen and chest being the most dangerous. Death may occur from shock soon after the injury, or later from suppuration, septicæmia, pyæmia, tetanus. Perforating ulcer of the duodenum, causing death, sometimes occurs after burns. The cicatrices which form after healed burns may cause great deformity. These may also produce contractures of joints and complete incapacity.

BURSA.—A pouch lined with a delicate membrane containing a little fluid. It is found in numerous situations within the body—over knee-cap, elbow (*see* **Beat Elbow, &c.**), under insertion of muscles (sartorius and gracilis) at inner side of knee, under semi-membranosus and gastronemius muscles at popliteal space (back of knee-joint), at buttock under gluteus maximus muscle. They may become inflamed by injury, blow, strain, &c., and develop to a considerable size.

Housemaids' knee (q.v.) is a chronic form of bursitis, which appears as a tense sac of fluid in the bursa in front of the knee-cap. It is a slow, progressive condition, and may become inflamed and painful, preventing kneeling. It can be removed by operation, and recovery will usually be complete in a month's time.

Enlarged bursæ cause incapacity usually by mechanical obstruction to movements ; they sometimes communicate with the joint in the neighbourhood. The excessive fluid may in time become absorbed, or suppuration may take place. A suppurating bursa may burst or be opened surgically and get well, or the skin may heal up superficially and the trouble recur time after time, so that for thorough cure it may be necessary to dissect out the whole sac. This may be a simple matter if the bursa is superficial, but may give rise to difficulty and grave danger if deeply situated.

CACHEXIA.—The name applied to the appearance of grave ill-health and anæmia which results from the continued presence of such diseases as cancer, malaria, chronic lead poisoning, chronic mercurial poisoning, &c.

CALCANEUM (also called **Os Calcis**).—The heel-bone. Generally fractured by falls on the foot, as well as by powerful contractions of the muscles of the calf. It may be crushed. The fracture may be simple or compound. Generally takes quite two months in simple fracture before the patient can bear much weight on the foot, and it will usually be four months before walking can be done with comfort. Sometimes the injury damages the architecture of the foot, and a traumatic flat foot may result. Fracture of the calcaneum may sometimes cause permanent incapacity almost equivalent to loss of the foot on account of the pain produced by walking. If the loss of the whole or part of the bone is occasioned by injury or operation, great disability will result. A radiograph is useful in determining the amount of damage to the bone. (*See* **Foot.**)

CALCICOSIS.—A chronic disease of the lungs which occurs in persons who work in marble and inhale the dust. (*See* **Dust. Phthisis.**)

CALLUS (*see* **Bone**).—The exudate which is thrown round the ends of a broken bone, being Nature's method of repairing a fracture. The callus is at first soft, then passes through various stages of hardness until it finally becomes bone. If there is much comminution or overlapping or separation of the broken ends, then the amount of callus will be large. If the apposition of the fragments is good the amount of callus will be small. Another condition necessary for the callus being small is that the fracture should have rest. This is difficult in some situations, as in the ribs, where natural breathing causes movement. A large mass of callus diminishes in size by natural processes of absorption in the course of time. If very large, it may produce pressure on neighbouring structures, and interfere with their function. In certain situations, where a nerve runs close to or in a groove in a bone and fracture occurs there, the subsequent callus formation may include the nerve in its grip and destroy it, producing paralysis of the muscles supplied by the nerve. The absence of callus may be due to want of apposition and rest for the part, or it may be due to some general disorder, wasting disease, rickets, and possibly syphilis. Sometimes a piece of loose bone or portion of muscle interposes between the fragments and prevents union, but *non-union* may occur from other local and constitutional causes. If the callus is slow in development the condition is then spoken of as *delayed union*. *Vicious union* is union of a broken bone in an irregular or malformed position. *Fibrous union* is union by fibrous tissue ; it may sometimes be as effective as bony union, but it is very liable to eventually stretch.

CANCER. Carcinoma.—A general term for malignant tumours. Strictly speaking, it applies only to destructive growths of ephithelial origin, that is, arising in the epithelium composing the skin and mucous membrane, glands, &c.

Sarcoma.—A name for another type of malignant tumour which contains cells like to the connective tissues of the fœtus. It occurs in bone, muscle, &c.

Workers in certain trades appear to be prone to suffer from cancer, as in chimney-sweeps, tar, pitch, grease and paraffin workers ; possibly bacon curers (Oliver), anilin workers (Relm). The relation of injury to the development of cancer has received a very great deal of attention, the result being that we are in a position to give to traumatism a place amongst the factors which influence the production of malignant growths. The real cause, though the object of numerous researches, has as yet baffled inquirers. At present we have a number of observations which go to prove that continued local irritation can determine the development of a malignant growth. We recognise under this head chimney-sweeps' cancer, tar cancer, clay-pipe cancer, X-ray cancer, &c. In this class of superficial cancers the relations of cause and effect are not widely apart. In the more deeply-seated growths, especially those taking origin in muscle and bone, the sarcomata, we must admit that traumatism may play a causative part, though here the relationship is not quite so manifest. In this class the history is not usually that of continued irritation, but is the narrative of perhaps a single injury. If the deeply-situated organs, such as the lung, kidney, stomach, liver, intestines, &c., become affected with malignant disease, and there is an account of an accident, it is very necessary before accepting the disease as of traumatic origin that the records of the case should furnish evidence that the organ in question was damaged at the time of the accident. If a long interval of time separates the development of the tumour from the accident, these records should show a certain continuity and sequence in the symptoms and signs following the injury leading up to that period in which the growth is revealed. On the whole question of the traumatic origin of tumours, Sand is of opinion that to establish the relationship it is necessary that the accident should have caused local lesions, swelling, pains, &c., that the growth should develop in the organ involved directly or indirectly in the accident, that the growth should appear within between three weeks and a year for sarcoma (two to six months on an average), between six weeks and five years (average one to two years) for cancer, between one month and ten years for glioma (malignant disease of nerve structures, brain, spinal cord and eye), between three weeks and two years for other tumours. The patient should not be the subject of tumours of the same class previous to the accident. The traumatic origin is more likely if the patient has been healthy up to the accident. Youth is against traumatic origin (save in sarcomata, which are more common in youth). Many authorities think that the tumours described as of traumatic origin are really latent, that is, that they are dormant until stimulated into activity by injury. On the point of aggravation of tumours by injury, Sand holds that this would be established under the following conditions: if the accident cause, directly or indirectly, a tear or a hæmorrhage, &c., in the growth; if new symptoms of a serious nature show themselves within four days of the injury; if the development of the tumour was not at such a stage that an increase in activity was impending. A direct or indirect traumatism may induce in a tumour a breaking-up, and thus favour the production of metastases (the diffusion of the disease into other parts of the body), but it would most probably take a considerable time for these to develop, and their relation to the injury would be difficult to establish. An injury cannot originate a metastasis in the wounded part, but it may favour the more rapid development of an existing metastasis.

A question may arise as to whether in a state of general debility induced by an injury, the normal resistance of the body to the attacks of disease being thus diminished, may malignant growths evolve (apart from those which may properly be considered to have a relation to local trauma)? The answer to this question is, up to the present we have no scientific evidence to support the view that these growths arise under such circumstances.

CARBIDE OF CALCIUM (CAC_2).—A caustic chemical used in the manufacture of acetylene gas (C_2H_2). The gas is used as an illuminant in houses and on motor cars, &c. It has a peculiar etherial odour, and if inhaled in small quantities is not poisonous, nor is it harmful with plenty of air; but if present in a room to the extent of

40 per cent. by volume (Oliver) it may cause death. It is less poisonous than water gas or coal gas. The effects appear to be drowsiness going on to coma, the blood vessels become contracted and the subject does not bleed readily when pricked, there is asphyxia. The treatment is fresh air, oxygen, artificial respiration, stimulants.

CARBON BISULPHIDE (CS_2).—A colourless, disagreeable, inflammable liquid used in india-rubber works. The vapour given off by this substance is highly poisonous, and workers in factories where the ventilation is inefficient become affected. The poison is a subtle one. The symptoms in the slighter cases are headache, vertigo, vomiting ; these may disappear if the worker gets into the air. In larger doses there may be in addition delirium and delusions. In the chronic form there is general ill-health, tremor, loss of memory, difficulty in speech, diminution in muscular power, peripheral neuritis causing paralysis and loss of vision. Recovery may eventually take place, but there may be permanent incapacity. Scheduled.

CARBON DIOXIDE (CO_2) **and CARBON MONOXIDE** (CO).—**Carbon dioxide.** The gas which is present in badly-ventilated dwelling-rooms, factories, &c. It is not by itself a dangerous poison. The symptoms are headache, malaise, vertigo, fainting. A considerable tolerance of this gas can be developed, of course at the expense of robust health. A Departmental Committee of the Home Office fixed the standard of CO_2 in factories as 12 volumes per 10,000 of air during daylight or electric light ; where gas or oil is installed the proportion is not to exceed 20 per 10,000. The gas is produced in quantity during the fermentation of beer, &c., and is also given off from lime-kilns. It is frequently found in unused mines, pits, cellars, &c.

Carbon Monoxide (CO).—A dangerous poison. It is evolved from blast furnaces, in the manufacture of illuminating gas and a process of soda making, coke ovens, explosions in pits, charcoal fumes. It forms 7 to 10 per cent. of ordinary illuminating gas. It is found after the use of dynamite or gunpowder in coal-mines, and it is also present after explosions. It may escape from leaky gasometers. The fumes may be carried some distance by wind and produce its serious effects.

The symptoms, or "gassing" as it is called, may be evidenced by giddiness, headache, throbbing of the temples, later paralysis of limbs, convulsions, profound sleep, death. If the sufferer is rescued there will be tremor, difficulty in swallowing and speech. The gas produces its effects by displacing the oxygen in the blood and becoming a firm chemical combination with the hæmoglobin, which is thus unable to carry oxygen. Small quantities do not produce immediate poisoning, and a certain tolerance can be produced. Oliver has habituated dogs to considerable doses, and believes that man can be similarly trained. *Post-mortem* appearances show that there has not been suffering, the face is calm and the pupils are dilated ; the blood, if death is recent, is cherry-red in colour ; there are hæmorrhages in muscle, skin, brain, lung and stomach. Spectroscopic examination of the blood shows the two bands between D. and E., the yellow and green lines.

CARIES.—A disease of bone in which the molecules decay or die. As a result of the disease, a chronic or cold abscess forms, the matter or pus being thick and yellowish, which may burrow into the soft tissues round the bone, or it may find an exit internally or externally. Caries is usually associated with infective inflammation of the bone (osteomyelitis, q.v.), tuberculosis (q.v.), actinomycosis (q.v.), and syphilis (q.v.).

CARPUS.—The eight small bones of the wrist, with their joints. The bones are in two rows, the first next the forearm forming with the radius and ulna (the bones of the forearm) the wrist-joint. They are called, reading from the thumb to the little finger, scaphoid, semilunar, cuneiform, pisiform. In the second row, more distally placed, are found trapezium, trapezoid, os magnum, unciform, and more distally still the five bones of the metacarpus; these terminate in the phalanges or fingers.

The movements of the wrist-joint may be limited by diseases or injuries, such as tuberculosis, fractures, &c. **Acute inflammation** of the joints may follow injury, strain, &c.; this may pass off, or it may result in chronic inflammation and adhesions in a joint. **Crushes** of the carpus, with or without a wound, are severe injuries, and sometimes produce a large amount of depreciation in the value of the hand. The bones may be fractured individually, and the scaphoid seems to suffer most frequently. In cases of weak or sprained wrist after accident this injury should be kept in mind. X-ray examination is generally necessary; and in this connection it is well to note that in 1 per cent. of persons (Dwight) the scaphoid appears to be divided into two parts in its development, and that this might under X-ray examination simulate a fracture. Ordinary **sprained wrist** treated by massage will usually get well in about four weeks. If there is great effusion into the sheaths of the tendons on the front and back of the joint, which sometimes follows sprain, it may take a very considerable time for recovery, and there is always risk of the tendons becoming fixed in their sheaths and a partial or complete anchylosis ensuing. If the wrist has to be put up in plaster or splints, and thus immobilised, the resulting stiffness and disability will be of much longer duration. A **recurrent form of synovitis** of the wrist (q.v.) takes place after injury, repeated jars, or concussions in miners. (*See* **Tendon.**)

Duplay and Madelung have described a form of **chronic arthritis** occurring among workmen in which there is a partial dislocation of the carpus from the radius. There may also be a condition of slackness of the capsule of the wrist-joint, and a tendency to dislocation of the hand in consequence of persistent forcible movements (Tillmans).

In some cases the strength of the joints is normal, but a subluxation takes place as a sequel to some alteration in the growth of young persons caused by severe, long-continued movements. In this there appears to be a change in the articular surface of the radius. It becomes oblique, the dorsal edge thickened, and the palmar edge is checked in its growth, the chief late effect being inability to fully dorsal flex (bend back) the hand. After a time the patient accommodates himself to the abnormal position, and is able to use the hand fairly well. Tillmans recommends the wearing of a support or wristlet of leather if there is a tendency to the condition.

The French courts hold that partial anchylosis of the wrist is not sufficiently incapacitating to warrant any compensation. Probably this is in the main correct, provided that there is no acute or active mischief in the joint, and that delicate movements in the wrist are not necessary to the employment. Brouardel's estimate of incapacity in complete anchylosis of the right wrist (right-handed persons) is 5 per cent. in trades specially requiring the use only of the lower limbs ; 45 per cent. in art workers ; in others 15 to 20 per cent. Austrian scale ; 20 to 60 per cent. French scale. A less estimation by half for the left wrist (Ollive and Le Meignen).

CELLULITIS.—Inflammation of the subcutaneous connective tissue. A term mostly used in connection with purulent inflammation of the cellular tissue. It usually follows the entrance of a micro-organism through a wound or abrasion. When the disease is developing there are frequently to be seen red lines on the skin radiating from the wound ; these show inflammation of the lymphatics (lymphangitis). If the skin becomes involved the condition will have the appearance of erysipelas (erysipelatous cellulitis). The disease may produce extensive local and constitutional symptoms, which may be serious or not, this depending on the nature and amount of infection of the wound. (*See* **Beat Elbow, &c.**)

CHANCRE. Chancroid.—The locally-infected ulcers of venereal disease. They are known as hard and soft sores. The hard sore is the true chancre, or primary lesion of syphilis. It makes its appearance from ten days to four weeks after inoculation ; it is single, rarely multiple. The soft sore or chancroid usually appears five days after infection, very rarely as late as ten days. It produces no constitutional symptoms. The hard produces constitutional symptoms, and in about six weeks a coppery-coloured rash appears. This is the second stage. After the lapse of about two years the tertiary stage begins, characterised by the presence of hard nodules, which at times soften and leave abscesses in bones, muscles and organs, such as kidney, lung, brain, &c. Treatment usually prevents this stage.

True syphilis can be contracted in the course of employment, as in the cases where glass-blowers have used a blow-pipe infected by the mouth of a syphilitic fellow-workman. A policeman has been known to be virulently infected by the bite of a syphilitic prisoner. Medical men and midwives have frequently become inoculated in the carrying out of their duties. In such cases the primary sore would be on the injured part, and be a syphilis insontium.

Injury can determine certain local manifestations of the disease in syphilitic persons which may produce incapacity out of proportion to the severity of the injury. The infection of the system is frequently manifested by inflammations in the eye (keratitis, choroiditis), joints (arthritis), bone (osteitis, periostitis), the testis (orchitis), muscles, &c., gummata, cerebral troubles. Wounds in syphilitics heal slowly, and fractures may remain ununited, and sometimes the bones are somewhat readily broken. It is believed by some that *injury can awaken* into activity a *latent syphilis* and cause local manifestations remote from the injured parts. Dreyer reports (Sand) that a man fell from a scaffold, breaking humerus and femur ; a little later he developed syphilitic lesions of the nose and palate.

Sand says that in order to admit the *rôle* of traumatism in such cases as this it is necessary that (1) the syphilis ought to be latent two years at least; (2) the accident ought to have been severe enough to cause disturbance of the general health, (3) the syphilitic manifestations ought to appear in thirty days after the injury.

CHARBON. Anthrax (q.v.).

CHIMNEY-SWEEPS' CANCER.—Epithelioma of the scrotum in chimney-sweeps is believed to be due to the long-continued irritation caused by the constant presence of soot on the part. The disease gives evidence of its maturity by the appearance of warty growths, which may remain quiescent or develop into ulcers. These ulcers progress and destroy the whole scrotum (purse). The glands in the groin become infected, and are eventually open, putrefying sores. The disease may ulcerate into the femoral or external iliac arteries and cause fatal hæmorrhage. The disease is curable by early operative removal. Scheduled. (*See* **Cancer. Epithelioma.**)

CHLORINE.—The manufacture of soda or salt cake by the older methods is still in force for various reasons. This process has other chemical manufactures associated with it. Common salt is acted on by sulphuric acid (vitriol), and large quantities of hydrochloric acid (spirits of salt) are evolved, the vapour (chlorine) being intensely irritating; especially does it destroy the teeth, so that workmen need to be protected by wearing flannel rolled round their faces. In the manufacture of bleaching powder chlorine gas is passed over lime in a chamber which is closed. After a time workmen have to enter this chamber to shovel what is now bleaching powder into casks. The men must wear goggles and have their heads and mouths protected by flannel. They may become "gassed" by the fumes, and suffer from vomiting, coughing, feeling of suffocation. The later symptoms are chronic bronchitis, emphysema,

&c. A form of inflammation of the skin (dermatitis), due to the action of hypochlorite of soda, occurs in the electrolytic manufacture of chlorides of calcium, sodium and potassium.

CHOREA. St. Vitus's Dance.—A disease characterised by involuntary, irregular, convulsive movements affecting the muscles of the head and neck, face, arms, legs, &c. It occurs mostly in the young between the ages five to fifteen. It may be epidemic, and it is sometimes hereditary. The patient is frequently unable to grasp or walk, and speech is indistinct. There is also a chronic incurable form lasting from ten to twenty years, called **Huntingdon's Hereditary Chorea.** It appears between the ages of thirty and fifty. This latter form is said to have occurred after injury (Westphal, Muller, Sand).

The usual form of chorea (chorea minor) may follow a large number of diseases, such as fever, rheumatism, &c. Worry, fright and injuries are also recognised exciting causes. This form lasts from six weeks to six months; almost all the cases recover, but relapses are frequent. In adults this type is somewhat more serious, and in a very few instances death has occurred.

There is also an **hysterical form of chorea** following injury. In this the movements are rhythmical, regular, continuous (chorea major).

CHOREA SCRIPTORIUM. (*See* **Cramp. Telegraphists' Cramp.**)

CHROME, CHROMATES, BICHROMATES, CHROME ULCERATION, or its SEQUELÆ.—The chrome preparations mostly in use are chromic acid, bichromates of sodium and potassium. In the manufacture of bichromates great quantities of dust are created. It undergoes several processes before it becomes crystalline. Workers in the crystal-making department suffer considerably. They get the dust and fumes into contact with hands, arms, face, &c., producing inflammation, boils, pimples, ulcers ("chrome holes"); these are found usually on the knuckles and at the bases of the nails. Ulcer and perforation of the cartilagenous septum of the nose is also found frequently. Chrome solutions are used in dyeing, calico printing, coal-tar manufacture, photography, &c. The ulceration of the nose does not appear to cause any great incapacity, nor is it followed by deformity. The sores on the hands, &c., unless extensive or affecting the bones, heal up in a few weeks. Scheduled.

CHRYSOIDINE.—A reddish crystalline powder used by bootmakers to colour soles of boots, and in tin lacquering. It may produce irritation of the skin, but this is believed to be mostly due to other ingredients with which the chemical is mixed for use in these trades. Injury produced by this substance will probably be covered by the "eczematous ulceration description" in the schedule of industrial disease for which compensation is payable.

CHYLOTHORAX.—Chyle (the milky fluid product of digestion present in the thoracic duct) in the pleural cavity, due to injury of this duct. It normally empties its contents into the blood stream at the junction of the internal jugular and subclavian veins in the left side of the thorax. The lesser forms of such an injury usually get well.

CHYLURIA.—A disease due to the presence of a parasite (the *Filaria Bancrofti*) in the lymph channels. The chyle (milky fluid product of digestion before it passes on to the blood) appears in the urine and pleural cavity, &c. This disease has been simulated byadding milk to the urine. The fraud can be detected by careful observation and a chemical examination of the urine for lactose (milk sugar). Human milk contains lactose, 5 per cent.; ass, 4.5 per cent.; cow, 3.8 per cent. *Rubner's test for lactose* is: Boil 10 cc. of the urine with a large quantity of acetate of lead solution four minutes. If lactose is present the solution becomes yellow or brown. Add ammonia as long as the precipitate is dissolved. The solution becomes brick-red, then a cherry-red, and copper-coloured precipitate forms; finally, the solution becomes colourless. This detects 0.3 to 0.5 per cent. or more. (*See* **Bright's Disease. Diabetes. Urine.**)

CICATRIX.—The scar left after a wound has healed. This scar tissue, though it replaces the normal tissue which was destroyed by the wound, is not quite the same structure. It has a very great tendency to contract, often causing great deformities and disabilities, as is the case after burns on the neck, flexor aspect of elbow, hip, &c.; The chin may be thus fixed to the chest, and the elbow and hip joints bent up and immobile. There may be complete incapacity in a limb for work. Scar tissue may produce pain from pressure on nerve trunks. It is also a lowly-vitalised structure, and will readily break down into an ulcer which heals very slowly. Slight injuries and scars may cause ulceration, which may take a very long time to close up. A degenerative disease called Cheloid or Keloid affects scar tissue; it has the appearance of a reddish tumour, which spreads on to the adjacent healthy parts. In persons predisposed, even slight injury will cause it. Negroes are very prone to Keloid formation (q.v.).

Treatment is unsatisfactory, as the growth frequently recurs after removal.

CIRCUMFLEX NERVE.—This nerve supplies the deltoid and teres minor muscles, and is occasionally paralysed from injuries. The muscles become wasted, and the shoulder looks flat and droops; the arm can scarcely be raised. If the nerve is not destroyed recovery may take place after a prolonged period.

If in **feigned paralysis of the deltoid muscle** the hand is raised, the arm being outstretched, and the examiner lets go suddenly, the subject being taken unawares shows an appreciable interval before he lets the arm fall. If the subject declares that he is not able to raise the arm above the horizontal, a test of Regnier's may be used: let him bend the body forward and put the arms extended on each side of the head as if about to dive; then order him to straighten up the body quickly. If the arms do not fall immediately the paralysis is feigned (Sand, Ollive and Le Meignen). Another test, after Sand, is to place the two arms horizontally, and make the subject sit down at once on a very low seat. If during this movement the arms form an obtuse angle with the thorax, the paralysis is feigned.

CIRRHOSIS (of the Liver).—A disease of the liver which is chronic in its course. Two forms are recognised. The hypertrophic, in which the liver increases in size; there is not usually an alcoholic history (Osler), it may occur in children, and the cause is unknown. The atrophic, in which the liver contracts and produces obstruction to the circulation; the causes are alcohol in 50 per cent., syphilis, heart disease, infection from gall bladder.

Tillmans, Beck and Senator have recorded cases which they state may be called interstitial inflammation of the liver due to injury (traumatic cirrhosis). This view is strongly opposed, and as yet traumatism as a cause of cirrhosis of the liver is not universally accepted (Stern, Thoinot, Ollive). In the *Bulletin Medico Chirurgical des Accidents du Travail*, 1908, there is a note that five non-doubtful cases of traumatic cirrhosis of the liver are recorded. Alexander, in reporting the fifth, which was verified by autopsy, death having followed in four months after injury by a blow from the pole of a wagon, explained the condition as having ensued on a subcapsular hæmorrhage, and the formation of abundant tissue succeeded by retrogressive changes.

CLAVICLE.—The collar-bone. A bone which is rounded on its inner two-thirds and flattened on the outer third. It is situated just above the first rib, at the root of the neck in front. It forms an important part of the arch which connects the upper limb with the trunk. It also protects the deep vessels and nerves which pass immediately under it to the neck and arm. The inner end is attached to the sternum (breast-bone), and the outer to the acromion process of the scapula (shoulder-blade bone).

Dislocations may take place at either or both ends. Fractures may occur anywhere. Reduction of Dislocations can usually be effected, but there is very often the greatest difficulty in retaining them in their position. Unreduced dislocation of the outer end upwards causes a forward displacement of the shoulder and inability to place the hand on the top of the head, so that it may permanently prevent a workman from lifting heavy weights to the shoulder level. Unreduced dislocation of the outer end downwards causes at first difficulty in lifting the arm from the side; but there is not great permanent functional disturbance, as a new joint forms at the point where the end rests on the acromion. Unreduced dislocation of the inner end backwards is serious, as it may press on the vessels and nerves, or on the trachea (windpipe) or œsophagus (gullet). In this condition an operation may be required to cut off the displaced end and relieve the pressure. Unreduced dislocation of the inner end forwards is of frequent occurrence. It may be partial or complete; the movements of the arm are painful, and elevation above the horizontal may be impossible, but sometimes the full use of the arm is not greatly interfered with. Unreduced dislocation upwards of the inner end may also cause symptoms of pressure on the nerves of the vocal cords, and there may be a loss of speech. Removal of the end is required.

Fractures.—These generally occur from indirect violence, such as falls on the shoulder or hand, blows on the shoulder, lifting heavy weights, &c. The commonest is at the middle third, next most common at the outer end; the rarest at the inner end. The outlook in simple fractures is good, but there usually results some deformity, and there may be shortening. The amount of callus round the broken ends may be large, and cause pressure and consequent great pain on the large nerves. The sharp end of a broken collar-bone may penetrate the subclavian artery or vein and cause death. Non-union may occur; and in such a case, if there is enough fibrous tissue developed between and around the ununited ends to prevent movement, then there will not be much interference with function, but if these ends move freely the usefulness of the arm is diminished. Ordinary fractures will be well in about six weeks. Wounds of any of the adjacent structures will increase the gravity of the case, so that the outlook is dependent on the extent and nature of the complications.

Estimation of incapacity for imperfect recovery of a fractured clavicle, 16⅔ to 50 per cent. (Rohmer).

CLONUS. Ankle clonus, Foot clonus, Toe clonus, Wrist clonus.—A series of convulsive involuntary movements produced by the examiner suddenly and forcibly bending up the foot, &c. True ankle clonus is always abnormal. (*See* **Reflexes.**)

COLIC.—Acute pain in the region of the belly.

Appendicular.—Pain in the appendix vermiformis.

Biliary.—Pain due to passage of gallstone.

Copper.—Pain which sometimes occurs in copper-workers.

Devonshire, Lead, Painters', Saturnine.—Pain due to lead poisoning.

COLLES'S FRACTURE.—A fracture of the lower end of the radius (the bone of the forearm on the thumb side), within from ¼ inch to 1¼ inches of the articular end (wrist-joint end). It usually occurs from falls on the outstretched hand. The deformity is characteristic, there being a lump on the back of the wrist, making this have the outline appearance of a fork or spoon. When the fracture is treated early bony union is rapid, about three weeks. There is frequently permanent deformity, but this is not always incompatible with a functionally useful wrist. If there is much adhesion of tendons to their sheaths, the joint may be considerably limited in its usefulness. If there is bony obstruction to the movements of the wrist, an operation may be necessary. Sometimes the two bones of the forearm become fused together at the wrist after the injury, and, as a consequence, there may be permanent impairment in the movements of pronation and supination. A radiogram will show the various conditions. Valuation of the incapacity for anchylosis of the wrist-joint, 25 to 33½ per cent. (Rohmer). (*See* **Anchylosis. Carpus. Upper Limb.**)

COMPRESSED AIR ILLNESS or its Sequelæ (Caisson disease, Divers' paralysis, Tunnel disease).—A condition which develops in persons who work in compressed air. The disease is seen in its most severe form in workers in caissons, in the foundations of bridges. Inside these air is pumped to displace the water and soft mud, and the workers sometimes endure a pressure of as much as 6 to 7 atmospheres (90–105 lb.). After being in the compressed air chamber, workmen, when the shift is over, pass into another chamber where decompression or equalising of the pressure with that of the normal atmosphere takes place slowly. Workmen suffer in the compressed air, and also at the decompression stage and after it. If the compressed air is not pure they may get carbon dioxide poisoning; the compression may also produce acute pain in the ears and head. At the decompression stage, particularly if this is too rapid, there is pain in the joints, back and stomach, vomiting, headache; there may also be paralysis of legs, bladder and rectum, blindness, death. The milder cases get well in from a few hours to a week. The disease is believed to be caused by the forcing of air into the blood under pressure, and its too rapid liberation, causing frothing of the blood. Oliver believes that the normal decompression time should be one minute for every 3–5 lb. of pressure. If the workmen are ill when they come up out of the workings, they should be placed in a medical compression caisson, and recompressed in a pressure of 20–24 lb.; after this the decompression should be extremely slow—three minutes for each lb. of pressure (Leonard Hill, Oliver). Scheduled.

CONCUSSION.—The symptoms produced by violent jar or shock. The immediate effect of a concussion of the brain is to produce either momentary confusion or transient loss of consciousness. Recovery generally takes place rapidly, but if the unconsciousness persists it is probable that there is also some laceration or contusion of the brain. These will, after the recovery of consciousness, or possibly before this, give evidence of their nature by localising signs, and in addition there may develop later vertigo, headache, mental debility, epilepsy, insanity. (*See* **Brain.**) Concussion of the spinal cord is a condition resulting from blows, jars or shocks to the cord. It is probable that here also the permanence of the symptoms depends on actual damage, contusion, laceration, hæmorrhage and the development of chronic degenerative diseases. Some authorities contend that concussion of the cord is in itself a pathological lesion, though without visible alteration of structure.

The traumatic neuroses which follow concussion accidents are compounded of mental shock and physical injury. These nerve symptoms have so frequently followed railway collision injuries as to give rise to the name "railway spine," "railway brain," though the disorders can ensue from other causes, such as falls, blows on the head and back, fright. Two or three groups of disturbances are recognised, but they may be all more or less combined in a single case—traumatic neurasthenia, traumatic hysteria, irregular forms. Some of these are believed to be functional disorders, but there are others which may depend on actual lesions in the brain and cord.

At present our knowledge of their pathology is very meagre, and any classification is somewhat artificial, as certain symptoms and signs are common to all—headache, vertigo, backache, mental depression, sleeplessness, rapid pulse, anæsthesia, alterations in knee-jerk, &c. Some of these are the well-known "litigation symptoms," and it is essential to give careful attention in such cases to exaggeration or malingering, yet in doing this we ought to guard against considering neurotics as frauds. (*See* **Back. Backache. Neurasthenia. Spine.**)

Concussion injuries of the thorax (chest) may follow blows or falls from a height, and there may be no demonstrable injury. There is usually a great fall in blood pressure in the chest, and respirations become irregular; pallor, unconsciousness and death may ensue. The condition is rare. Such injuries as cause these symptoms frequently produce damage to the bony walls, and also to the heart, lungs, &c. (q.v.).

CONTRACTION.—The act of contracting. Applied to the contracting of a muscle in response to a stimulus. Electric currents passed into muscles cause certain named contractions. (*See* **Atrophy, R.D.**)

A clonic contraction is one in which the muscle contracts and relaxes alternately. A **tonic or tetanic contraction** is where the muscle continues in a state of contraction for a prolonged period of time. **Rhythmic contractions** take place in the heart muscle. Vermicular movements of the intestines in response to contractions of the muscles in them are called **peristaltic movements. Fibrillary contractions** are abnormal, involuntary contractions which appear in diseased or exhausted muscles.

CONTRACTURE.—A tonic contraction or shortening of muscles or other structures, causing limitation in the range of movements. It may be due to the progressive shrinkage of scar tissue, or it may follow injuries to and diseases of muscles, tendons and nerves, and nerve centres.

It may be congenital, as in various deformities—club-foot, club-hand, knock-knee, &c. It may follow inflammation and effusion in joints, and be, as it often is, associated with anchylosis (q.v.). It may be hysterical, or it may be simulated. Contractures which have a central origin will usually cause no great difficulty in forming an opinion. **Hysterical contractures** are more puzzling. They may come on suddenly after trifling injuries, and disappear equally rapidly; they may persist, or they may occasionally be permanent; they often increase when the examiner seeks to overcome them; they do not, as a rule, relax during sleep, though they mostly disappear during ether sleep. These patients do not exhibit much alteration in the knee-jerks, but they are never lost, nor is there ever any ankle clonus. There are other signs of value in diagnosing hysteria, namely concentric contraction of visual fields and disturbance of the colour sense; there is often loss of voice (aphonia).

Simulation may be attempted, but it is not at all an easy thing to carry out successfully. To completely simulate a contracture of a joint in defiance of modern diagnostic methods, electrical reactions, X-rays, ether sleep and observation in hospital, is a task which would require a very remarkable amount of ability and knowledge, and not even the most careful study of medical books can provide this. (*See* **Hysteria. Malingering.**)

CONVULSION.—An involuntary seizure, in which the muscles of the body are thrown into violent contractions, as in chorea, epilepsy, hysteria, uræmic poisoning from Bright's disease.

COPAIBA BALSAM.—A drug used in the treatment of gonorrhœa. If taken internally it gives a reaction in the urine like albumin. In testing for albumin with the *heat test*, if copaiba is suspected add twice the volume of alcohol in the cold, and the cloud of copaiba disappears. Urine containing copaiba also becomes pink with hydrochloric acid, and on boiling turns reddish-violet. **Sandal oil** and **Styrax** give a similar reaction (Caspar).

CRAMP.—A spasm of the muscles which causes pain. **Auctioneers' cramp** is a spasm which affects the muscles of the left side of the mouth. Compositors', hammersmiths', seamstresss', trap drummers', telegraphists', violinists', waiters', writers' (chorea scriptorium), watchmakers' cramp—these are all affections of a functional nature, attacking groups of muscles which have become over-tired or over-strained. The disease frequently necessitates the complete abandonment of the special work at which the subject is employed. The outlook is not always favourable, and if the disease does get better it frequently recurs. The above are considered to be occupation neuroses, that is, nervous conditions developed by the peculiar nature of the employment. (*See* **Telegraphists' Cramp.**)

CREOSOTE.—An oily distillate obtained from wood tar. Workers, in its manufacture from tar, may suffer from epitheliomatous cancer, creosote warts, &c. (*See* **Cancer. Epithelioma.**)

CREPITUS.—A name used for the crackling or grating sound heard when the rough ends of a broken bone rub against each other. False crepitus is the name given to the soft crackling sound heard on movement when there is inflammation and effusion into the sheaths of tendons and joints. (*See* **Anchylosis. Fracture.**)

CRISIS.—A sharply-marked turning-point in the course of a disease, or certain painful spasms which are signs of particular diseases, such as the gastric crises of locomotor ataxia, in which pain and vomiting are the symptoms. **Dietl's crisis** occurs in displaced or movable kidney. It is due to the partial twisting of the kidney, and consequent obstruction to the outflow of urine, and is characterised by great pain, vomiting, collapse, and a sudden discharge of a considerable quantity of urine.

CRURAL NERVE.—This nerve comes from the 2nd, 3rd, 4th lumbar nerves, and supplies the psoas, sartorius, pectineus (partly), quadriceps muscles. It may be injured in fractures of the vertebræ or pelvis or by wounds. Sometimes the nerve in the thigh may be injured by fractures or dislocations of the femur. There will then be as a result inability to flex the thigh or extend the leg, and the patient drags the leg in walking. It may cause great incapacity for work if permanent.

CRUTCH PALSY or PARALYSIS.—Paralysis of the arm and wrist from pressure of a badly-fitting crutch on the arm-pit, due to injury of the musculo-spiral nerve (q.v.). Slight cases will usually be well in from one to four weeks.

CYST.—A sac or bag which has liquid or semi-solid contents. *Encysted* means that a substance (say a bullet) has become surrounded by a sac or covering, and is buried in the tissues.

DEAFNESS.—Partial or complete loss of hearing in one or both ears. Deafness more or less complete is engendered in men who are obliged to perform their duties in a noise, in such workers as boilermakers, smiths, railway engineers, &c. It may also follow head injuries, compressed air illness, and the deafening noise produced by explosions, heavy gun discharges, &c., inflammation of the ear and various constitutional diseases. It may be hysterical, simulated or senile. The following *Tests* are used to assist in finding which part of the auditory apparatus is affected. *Weber's*: Place on the top of the head a low sounding tuning-fork, if it is best heard in the healthy ear, or the less affected one in bilateral deafness, there is a lesion of the nerve apparatus; if heard best in the diseased ear then there is obstruction in the external or middle ear to the transmission of sound waves. *Rinne's test*: The fork is placed behind the diseased ear. When the patient declares that he no longer hears it, it is at once placed opposite the meatus (without re-sounding it); a normal ear will continue to hear it.

In a case of alleged deafness in one ear, close the healthy ear of the subject with wool or the finger-tip, place the sounding-fork on the top of his head. If he states that he does not hear it at all, not even in the blocked ear, he is malingering.

Coggin's stethoscope test: Place a binaural stethoscope with long tubes (several feet) in the ears of the patient, the chest piece coming behind his back; the tubes can be compressed at the will of the examiner, and the sound, spoken words, &c., conducted as he pleases either to the healthy ear or alleged deaf one. A few repetitions of the experiment will usually confuse the simulator, and he will contradict himself.

Two examiners may test after the manner of Kern. Two rubber tubes, each two metres long, and each joined to an ear trumpet, the free ends being placed in the ears of the patient. Two examiners pronounce together, keeping time, into each trumpet phrases composed of the same words. One of the two omits one of these words without the phrase appearing altered. A says: "The chief colours are blue, red, green." B says (with the tube connected with the healthy ear): "The chief colours are blue, and, green." If the patient hears only with the healthy ear, he will say: "The chief colours are blue and green." If he repeats: "The chief colours are blue, red, green," it is evident he has heard with the deaf ear.

According to Babinski, deafness due to lesion of the internal ear is accompanied by an objective sign. A small electrode, with one milliampere of continuous current, is applied to each side a little above the tragus; in the normal state the head inclines to the positive pole (Anode). In lesions of the internal ear, whatever be the direction of the current, either the head is not inclined, or it is inclined to the diseased side. If the negative pole (Kathode) is placed below the tragus, or point of the lobule, the positive placed above and in front of the tragus of the other ear, the head rotates slowly toward the positive pole. In lesions of the ear this rotation takes place only when the positive pole is on the diseased side; no rotation when the positive pole is on the healthy side (Sand).

In feigned, complete, bilateral deafness the important points are: careful examination of the ear, if necessary observation in hospital, ether sleep, addressing the patient as he is becoming awake. Seriously deaf persons as a rule watch the lips of a speaker. Hysterical deafness usually has associated with it other signs of hysteria, and a tuning-fork behind the ear is not heard, whilst it is heard when held before the ear. (*See* **Ear. Hysteria. Vertigo.**)

DEGENERATION.— Deterioration due to morbid changes in the tissues or the deposit of some abnormal matters.

Amyloid Degeneration.—A retrogressive process due to the presence of a serum albumin in the tissues. It occurs in wasting diseases, prolonged suppuration, &c. Several organs may be affected at the same time, such as kidneys, liver, &c. The disease is a fatal one. Iodine test for amyloid in the tissues: Wash the material, render it acid with a little acetic acid (this may be omitted), place for a short time in a solution of iodine 1, potass iodide 10, distilled water 100, wash again; amyloid stains reddish-brown, the surrounding tissue a straw colour.

Atheromatous Degeneration. — *See* **Arterio-sclerosis. Aneurism.**

Fatty Degeneration.—The deposit of fat globules in the tissues, as in the heart, &c.

Senile Degeneration.—Changes chiefly of the atheromatous kind, which are associated with old age. (*See* **Senility.**)

DELIRIUM TREMENS, TRAUMATIC.—Delirium tremens is usually due to alcoholic excesses, and is manifested by wandering and incoherent speech, wakefulness, excitement. In alcoholic subjects slight injuries may determine the onset of the disease. This will be all the more likely to happen if the person has previously suffered from it. Death may ensue. Patients may tear off dressings and splints, &c., and so neutralise efforts to repair their injuries; they also have suicidal tendencies.

DELUSION.—A mistaken belief which, though false, no proof, not even that afforded by the individual's own sense, will cause him to give up. If it occurs in an insane person it is an insane delusion.

An Illusion differs from this in that a person falsely interprets things which really exist. He may see a table and imagine it is a man. He may hear a whistle and affirm that it is the archangel's trumpet. If the subject of an **hallucination,** he says that he hears the archangel's trumpet when there is no sound of any kind to be heard by anyone. The other senses may also be affected in hallucination.

DIABETES.—A disease characterised by the passage of a considerable excess of urine. The term is somewhat general, and covers a number of conditions.

Diabetes Mellitus is a condition in which the quantity of urine is excessive, and there is also sugar present in excess.

Diabetes Insipidus is a disease in which the urine is large in amount but there is no excess of sugar.

Sugar in the urine (**glycosuria**) is a malady which is found after injuries to the head, spine, liver, pancreas and lung. It may follow fright, sudden emotion, falls from a height, &c. It may be a temporary, traumatic glycosuria, or it may be a sign of true diabetes mellitus.

In the temporary form the sugar appears in the urine in from eight to twelve hours after the injury. It may disappear at the end of twenty-four hours, or it may remain for three weeks to a month (Cadeac and Maignon). The quantity of sugar may be very small, 0.1 per cent., or it may be abundant. This type of glycosuria was found in 9.3 per cent. of the cases of head injury of varying severity collected by Higgins and Ogden. This temporary form is not accompanied by any of the severe symptoms of true diabetes, but if the sugar persists it may be a transition stage between the comparatively mild disorder, traumatic glycosuria, and true diabetes.

Diabetes Mellitus, or true diabetes, is recognised by the presence of sugar in the urine, by thirst, enormous appetite, wasting, weakness. It must be looked upon as a serious disease.

It may follow injuries to the head, spine, abdomen, &c.

There are two types of true diabetes acknowledged as having followed injury, the acute and chronic.

Cases of the acute type are recorded, one by Rossbach: A child aged seven months fell on the head, diabetes ensued rapidly, death occurred in four months. In a case of Loisnel there was a violent injury to lumbar region followed by diabetes on the tenth day, and death two and half months later. In both of these the health of the subject is stated to have been good before injury. Other cases are recorded in which the symptoms appeared immediately and lasted up to six months, with eventual recovery in some, and in others a transition into diabetes insipidus.

In the chronic type the symptoms may set in early after the injury, as in the case of Griesinger: A man fell from a height, no local lesions were discovered, general concussion probable, diabetes the night following, death five years later. Naunyn records also a case of fracture of the skull in which diabetes ensued three weeks after. A year previously the man passed an examination for life insurance, so that it appears that there is no question of his having had diabetes before the injury. The chronic type may set in slowly and insidiously; so silently may the disease have established itself after the injury, that it is sometimes very difficult to determine the date of its first appearance. Albuminuria may also be an associated condition, and is of grave import. Brouardel and Richardière believe that in traumatic diabetes the nervous symptoms, tremors, vertigo and sometimes paralysis of the hysterical class predominate.

In a case of Brouardel the disease appeared a year after the injury. In one of Fredichs the interval was four years. Bailey believes that trauma is most important as a causative agent in cases where the disease develops gradually after the accident, and that a patient who exhibits the signs and symptoms directly after the injury was probably a diabetic.

On the point of injury aggravating the disease it is certain that if injury can cause it, it can also aggravate it.

Confirmed diabetics are mostly enfeebled and are often suffering from tuberculosis, consequently they have little resisting or recuperative power. The duration of the disease varies. It is often rapidly fatal in young persons. In older persons it may become stationary, and the later in life it appears the more likely is it to assume a chronic form. Operations on diabetics are more than usually serious, but from Gersuny's clinic there is a report of ten operation on diabetics without a death; some of the operations were major ones.

It is well to remember that glycosuria can be provoked by the absorption of phloridzine or oxalate of ammonia.

Simulation may be attempted by the addition of glucose to the urine or the injection of this by a catheter into the bladder; observation in hospital will readily solve the question.

Diabetes Insipidus.—Has followed injuries to the head, dorsal and lumbar regions, fright, emotion, &c. The disease is characterised by excessive thirst, and the voidance of large quantities of urine of low specific gravity without sugar. The disease generally appears within the first week after the injury. Oliver thinks that the observation of changes in the optic disc not necessarily accompanied by loss of vision will aid the diagnosis. The disease may follow a temporary glycosuria. The patient generally gets well after several months, but sometimes there is a progressive disturbance of nutrition and work becomes impossible. Ollive and Le Meignen believe that even in this state the patient is not incurable, and they think that suggestion is a very appropriate treatment.

DIAPHRAGM.—The muscular and tendonous partition between the chest and abdomen. It may be ruptured, and the stomach and intestines may enter the chest cavity. These injuries are severe, and death usually follows, but cases have been known to exist for a long time in which the abdominal viscera have entered the thorax through a rent in the diaphragm. Strangulation takes place sooner or later, and death ensues unless the condition can be relieved by operation.

DISLOCATION.—The abnormal displacement of any part, especially of articulated bones as in a joint. It may be simple; compound, in which there is a wound; complete; partial; complicated with other injuries; congenital; habitual, one which readily recurs. The signs and symptoms are briefly: Dislocation occurs at a joint, there is pain, irregularity, diminished mobility, and when reduced it does not usually recur.

DISSEMINATED SCLEROSIS. Multiple sclerosis. Focal sclerosis, Insular sclerosis.—A disease due to patches of induration in the brain or spinal cord or both. The symptoms are debility, loss of harmony and jerking in muscular movements, mental exaltation, a peculiar form of speech in which the syllables are separated by prolonged pauses (scanning), nystagmus. The signs are in addition, exaggerated knee-jerks, ankle clonus, epileptic and apoplectic seizures. It may last years, but is incurable; there may be improvement and recurrence. It is an incapacitating disorder. The condition may follow infectious disease, such as typhoid, &c., or it may arise without any discoverable cause. Mendel, in 1897, drew attention to the relation of injury in four cases; the injuries were fall from a height, contusions of head and vertebral column, chill following immersion.

Jellife records one hundred and nine cases, in thirteen of which there was a history of trauma. Oppenheim states that he has seen a case follow an extensive burn. Eulenburg and Poledne relate cases believed to follow electric shock. Thoinot has difficulty in accepting trauma as a cause, but believes it can aggravate the disease. K. Mendel holds a somewhat similar opinion; whilst Bailey writes that "it is not to be gainsaid, however, that the typical symptoms of multiple sclerosis develop in direct sequence to severe general injuries, and to injuries to limbs."

DROPPED FOOT. DROPPED WRIST.—**Dropped foot** is a paralysis of the foot and toes due most frequently to alcoholic neuritis, chronic arsenical poisoning, &c. The anterior tibial nerve, which supplies the extensor longus digitorum and proprius, peroneus tertius and tibialis anticus muscles, is the one affected.

Dropped wrist.—A paralysis of the hand due to lead, arsenic and alcoholic poisoning. Injuries may occur by crutch pressure, fracture, wounds, during sleep (the Saturday night or Sunday morning paralysis is a pressure paralysis of the musculo-spiral nerve caused during drunken sleep). The musculo-spiral nerve is the nerve affected in drop wrist; it supplies the muscles of the back of the arm and forearm and the skin of back of hand. One of the muscles supplied by this nerve, the supinator longus, usually escapes paralysis in the drop wrist of lead poisoning. (*See* **Musculo-Spiral Nerve.**)

DUPUYTREN'S CONTRACTION.—A spontaneous contracture of the palmar fascia (the tissue under the skin of the palm). There is believed to be a gouty and hereditary influence at work. The affected part contracts and draws the fingers down into the palm, so that they lie firmly placed there. It most usually begins in the little finger. It is observed in those who have to do heavy labour with the hands and also in those who have not to do such work.

A contracture of the finger, somewhat similar in appearance, may follow suppuration in the palm, or burns or scalds there. These are of the nature of cicatricial or scar contractures. Contractures of the fingers sometimes follow displacements of tendons. Sand admits the traumatic origin of contracture of the palmar fascia (Dupuytren's contraction) not only in the case of wounds, burns, &c., but also in the case of a blow or pressure in the hollow of the hand. If the fingers are drawn into the palm the usefulness of the hand for grasping purposes is considerably diminished. The condition is very often incurable. (*See* **Cellulitis.**)

DUST.—The presence of dust in factories and workshops and in other places is calculated to produce ill-health. The name **nosoconioses** is given to affections produced by organic or inorganic dust. The particles produce local irritation, which may be merely mechanical, as in steel dust, or caustic, as in the dust of chemical works ; or, again, they may be readily soluble and produce poisoning, as in lead work. In addition the particles may carry with them such germs as those of tubercle, &c. The nosoconioses usually develop slowly and produce their dangerous effects late. When the skin is attacked by the dust the name **dermatoconises** is given. If the lung is attacked the name is **pneumoconioses** (this includes certain acute affections such as pneumonia). If the dust is swallowed and the digestive tract is affected the name is **enteroconioses** this includes such disorders as the hæmatemesis of porcelain workers. The **ophthalmoconioses** are the eye affections produced by dust. (*See* **Anthrax. Anthracosis. Phthisis.**)

DUODENUM.—(*See* **Bowel.**)

EAR.—Wounds, burns, &c., of the external ear, as a rule, heal rapidly, and unless the auditory canal has been involved and, as a late consequence, becomes blocked up, hearing is not interfered with. From the point of view of hearing the external ear or auricle is not indispensable. In Switzerland 500 francs (£20) has been the indemnity given for loss of the lobule of the ear (Rohmer). Injuries of the external auditory canal are sometimes associated with dislocations of the lower jaw. The deep bony portion of this canal may be involved in fractures of the base of the skull.

Rupture of the drum may occur from a direct blow, or it may be the indirect result of injuries to the head or lower jaw, or be caused by an explosion, detonation, &c. Rupture may follow violent coughing or vomiting. It usually heals up, but there may be infection of the wound and consequent suppuration which may damage the hearing apparatus. A recent rupture shows itself by the irregular edges. An old-standing perforation has usually smooth, even edges, and there will mostly be evidences of chronic suppuration. Acute inflammation of the middle ear may follow injury, rupture of the drum, or, as more often happens, it arises from throat infection through the Eustachian tube. The Eustachian tube is about 1½ inches long, and is an air channel connecting the tympanum or middle ear with the throat. If a rupture is of old standing it is recognised by the character of the pus and the presence of granulations, polypi, &c. Death may ensue from complications, such as brain abscess, &c. Unilateral sclerosis, or hardening of the structures of the middle ear may also follow injuries. If both ears are affected by this disease it may be a slowly progressing disorder arising from other causes than accident.

Hæmorrhage into the labyrinth and Menieres symptoms may arise from injury to the head, decompression after caisson work, explosions, &c. In this the patient suffers from vertigo, buzzing sounds in the ear, some deafness; he may fall, become pale, vomit, and show momentary loss of consciousness. Schwartze and Grafe observed deafness from injury to the auditory centre in the brain in a boy who had had his ears boxed, and who also was struck on the head. (*See* **Brain. Deafness. Vertigo.**)

ECCHYMOSIS.—A discolouration of the skin caused by the effusion of blood under it. Severe contusions are commonly, but not invariably, followed by ecchymosis. Colour changes take place in an ecchymosed spot in from eighteen to twenty-four hours. The blue or livid margin of the spot becomes lighter, it acquires a violet tinge, before its total disappearance it successively passes through shades of green, yellow and lemon. During this time the spot is increased in size, but its centre is always the darkest. If the injury is deep the ecchymosis may show itself at a distance from the part struck.

On the distinction between the effects of blows on the living and dead, Christian states that in a contusion inflicted during life the ecchymosed true skin is generally much discoloured and dark from the infiltration of blood throughout its whole thickness; the skin is also firmer and more tenacious, but a blow may also cause effusion under the skin without affecting it throughout. The condition of skin mentioned cannot be produced on a dead body, but it might be produced if the contusion was inflicted a *few minutes* before death.

It appears also that severe blows soon after death resemble slight blows during life. Bluish stains on the body after death are situated on the most dependent portions of the body, and may have no relation to injury.

Certain diseases cause appearances somewhat similar to ecchymosis, such as purpura, hæmophilia, erythema nodosum, &c.

ECZEMATOUS ULCERATION of the skin, produced by dust; or ulceration of the mucous membrane of the mouth, produced by dust. Inflammatory disease of the skin over exposed parts which develops into blisters and ulcers. The amount and extent of the ulceration depends on the nature of the irritating material. Chrome workers, tile-makers, colour-blowers in the potteries, bleachers, laundry workers, dyers, satinwood workers, steel grinders, sandpaper workers, stone-cutters, flax, linen, cotton and jute workers may suffer. Workers using antimony, arsenic, lead, mercury, &c., are liable to suffer from handling them. Handling cargoes of ore containing lime may cause irritation and ulceration. (*See* **Dust.**) Scheduled, but without the insertion of any description of the processes in the second column.

ELBOW-JOINT.—This is of the nature of a hinge between the lower end of the humerus (upper arm bone) and the ulna (the bone of the forearm on the little finger side). There is also a gliding joint between the humerus and the upper end of the radius (the forearm bone on the thumb side). Injuries to the soft parts occur. Burns may be followed by contraction of the scar, which may prevent movement. Injury may cause inflammation and suppuration of the synovial pouch at the tip of the elbow (olecranon process). (*See* **Beat Elbow.**)

Rupture of the tendon of the biceps muscle (q.v.) may occur, and will require operative treatment. Displacement of the ulnar nerve from its groove may also require operative treatment. Wrenches and contusions of the joint usually get well in from four to six weeks, though sometimes permanent limitation of movement remains, particularly if there has been a severe arthritis.

Dislocations of the bones of the joint may take place in various directions. If uncomplicated and reduced early, recovery takes place in about two months.

A relaxation of the capsule of the joint, with its liability to permit recurrent dislocation, may totally incapacitate a workman who requires the full use of a sound arm for heavy work. Fractures about the elbow-joint are often serious as regards the full use of the joint later, but sometimes, though the anatomical outlines of the bones are irregular, the functional use is fairly good. (*See* **Radial Nerve.**)

Frequently there is a considerable amount of anchylosis (q.v.) ; suppuration in the joint is nearly always followed by some anchylosis.

Cubitus Varus (ulnar flexion and pronation) and **Cubitus Valgus** (radial flexion and supination) following fracture may produce considerable incapacity ; they can sometimes be remedied by operation. X-ray photography in injuries about the elbow is essential to a full understanding of the conditions and the prognosis. Fractures of the tip of the elbow may unite by fibrous tissue, and not by bone ; the fibrous union may be as efficient as the bony. (*See* **Ulna.**) Injury may be the exciting cause of, or may aggravate tuberculous disease in the joint. (*See* **Joint.**)

Miners' elbow is a chronic effusion into the bursa over the elbow-tip. It is seldom incapacitating, as it can usually readily be cured by operation, and be fully healed up in a month.

Complete anchylosis occasions great depreciation in the usefulness of the limb. Loss of the movements of supination and pronation also occasions a great diminution in the working capacity of the limb. Estimation of incapacity in anchylosis in extension, 41 to 50 per cent. ; at an obtuse angle, 25 to 33⅓ per cent. ; at a right angle, 33⅓ to 41⅔ per cent. (Rohmer) ; at an acute angle, 20 to 25 per cent. (Austrian tariff). (The Austrian tariff appears to be 10 to 20 per cent. less than that of Professor Rohmer. It is mentioned here, as he does not give any figure for acute flexion.)

Relaxed joint (articulation flottante), 53 to 66⅔ per cent. ; malunion of a fracture of the forearm, with limitation of the movements of pronation and supination, 16⅔ to 41⅔ per cent. (Rohmer).

ELECTRICITY.—Accidental contact with live wires or lightning shocks may cause death, shock, burns, and also certain later results.

The Dangerous Trades Committee of the Home Office held that currents of 700 volts direct and 350 volts alternating were dangerous ; other experts consider that it is only high voltages, such as 1500, that are dangerous. Death is believed to be caused by sudden arrest of the heart's action (Oliver, Prevost, Battelli), or, as is more usually held, the respiratory centre is first affected. Lower voltages than those mentioned have caused death, particularly if the part of the body which comes into contact is damp, or if the person is wearing damp boots or standing on earthed metal. The *burns* inflicted by electric currents are deep ; they have a tendency to slough, and are painful. If the patients are unconscious, removal out of the dangerous area and prompt artificial respiration may save them. Among the later results of electric shocks are recorded cases of neurasthenia, hysteria, hemiplegia (Wendriner), general paralysis (Abadie and Grenier, Eulenburg), amyotrophic lateral sclerosis (Hoehl), multiple sclerosis (Eulenburg, Poledne).

In **electric welding** of metal the light produced may cause severe inflammation of the eyes, and for this reason a special form of spectacles is required for the workmen. The luminosity in electric welding is said to equal 8,000 candle-power, and the temperature may rise to 7,000° F.

In **electrical accumulator works** lead is largely used in the paste for the plates; and plumbism is of frequent occurrence.

X-rays are produced by passing electrical currents through vacuum tubes, having previously raised the current to a high potential by means of a Rhumkorff coil, and the use of some form of interrupter. Constant exposure to the rays will produce a form of inflammation of the skin (X-ray dermatitis), which has frequently developed into cancer. A point of interest in regard to this is, that the exposure of some forms of cancerous ulcers to X-rays is a most excellent method of curing them, but under these circumstances the diseased surface alone is permitted to be uncovered to the rays, and the dosage is regulated so that there is no risk to the patient. Operators now are careful to keep themselves out of the line of action of the rays, and also to protect their hands and bodies with efficient shields ; they also endeavour to avoid all needless exposure. With the short exposures used now in X-ray photography the patient takes no risk, and with the methods of protection adopted at present it is most probable that in future cases of X-ray cancer amongst operators will be very rare.

The pioneers in this work have suffered terribly, and have proved the necessity for protection by their sad experiences. The workmen employed in tube factories have also suffered severely in testing the tubes.

As an X-ray worker, I may say that I have a most thorough belief in the danger of constant exposure to the rays, and the importance of taking precautions against the effects.

ELEPHANTIASIS.—A disease of the lymph channels, characterised by a thickening and enlargement of the parts affected, legs and external genitals being chiefly involved. They become roughened, fissured, and the skin hangs in enormous folds. The disease may be serious. It is mostly due to the lodgment of a parasite (the *Filaria sanguinis hominis*) in the lymph channels. An identical condition may also follow such injuries or diseases of these channels as section, crushing or compression by callus or a cicatrix, erysipelas. Operative treatment is often required, but it is not always successful.

EMBOLISM.—The plugging of a vein or artery by a clot or by something such as a bubble of air, a globule of fat, a particle of septic matter, &c., which has been carried by the blood stream. **Thrombosis** is the plugging of a vessel by a clot or plug formed *in situ*.

Embolism of the lung or heart is extremely dangerous; of the kidney or liver, not quite so dangerous. Embolism may follow fracture, and it is particularly prone to follow fracture in the lower limbs (q.v.), for the reason that the deep veins are here likely to be injured by the traumatism; the veins become inflamed, and a thrombus forms which may become detached and carried into the circulation. Injuries to varicose veins, varicocele, &c., may also cause the dislodgment of a thrombus into the blood stream. Sprains, dislocations and simple contusions may cause phlebitis (inflammation of a vein) and the formation of a clot which may subsequently become an embolus. After a simple contusion the embolism, if it occurs, will usually happen during the third week, but it has happened later.

If **Fat Embolism** occurs the symptoms develop within twenty-four to seventy-two hours after the injury. Death from fat embolism is rare.

Embolism occurs as a complication of disease of the heart or aorta, in which case vegetations or clots are detached and transported by the blood into various organs, such as the brain. Paralysis or death may ensue. Injuries to malignant growths may cause a detachment of particles, which may be carried by the blood or lymph stream into other parts, and give rise to secondary disease by embolism. (*See* **Cancer.**)

EMPHYSEMA (Pulmonary).—Over-distension or rupture of the air vesicles of the lungs.

Interstitial Emphysema (air in the connective tissue) may follow wounds of the lung. The air travels from a wound or rupture at the root of the lung along the windpipe to the neck, causing **Subcutaneous Emphysema** (air under the skin). This may follow fracture of a rib and injury to the lung. The air fills the pleural cavity, and may work its way into the loose connective tissue around the ribs and finally reach the subcutaneous connective tissue. The air may reach the head and neck, and spread under the skin of the whole body, and cause death by invading the connective tissue of the lungs, causing obstruction of the circulation. A traumatism of the chest cannot create pulmonary emphysema, but it may hasten the development of the later stage of the disease, and so bring on incapacity (Stern, Thoinot).

Glass-blowers are said to suffer from emphysema. On the other hand, bagpipe players are said to be free from the disease.

EMPYEMA (Pyothorax).—The accumulation of pus in the chest cavity. (Pus in the gall-bladder is empyema of the gall-bladder.) It sometimes follows pleural effusion, pneumonia, gangrene of the lung, typhoid, tubercle, subphrenic abscess, fracture of a rib, perforating wound of the chest. Purulent effusions in the chest cavity following contusions of the thorax are rare. Brouardel, in *Les Blessures et Les Accidents du Travail*, 1906, relates a case where death followed three days after injury by violent blows. At the autopsy pus was found in the pericardium and pleura. (*See* **Lung. Pleura.**)

ENCEPHALITIS (Non-purulent).—Inflammation of the brain. It mostly follows infectious disease, but it may follow injury. Bailey quotes two cases recorded by Friedmann and Cramer, in which *post-mortem* examinations were made and the diagnosis verified. The disease followed falls on the head. The symptoms are dizziness, headache, stupor, coma, elevated temperature, paralysis.

The signs, if of traumatic origin, appear within two months in the acute and one year in the chronic cases (Sand). The average duration of the disorder in acute cases is about twenty-one days. If the patient recovers the symptoms may clear up, or one or more may persist and cause serious incapacity.

ENDOCARDITIS.—Inflammation of the internal lining membrane of the heart. A serious disease, generally associated with acute rheumatism or febrile diseases. It causes difficulty of breathing, rapid heart action, and disease of the valves. It may be acute or chronic. Acute septic endocarditis may follow a wound in any part of the body, through which infection is admitted to the system. Acute endocarditis has followed injury. In a case recorded by Biggs (Thoinot), the subject suffered a violent fall, followed at once by pain over the heart and murmurs at the aortic valves. There ensued fever, grave symptoms and death. At the autopsy an aortic valve was torn, and at its base there was a thick fibrous deposit; the rest of the heart was healthy. The fall determined the rupture of the valve and an opening for the entry of microbes, presumably from the blood, consequent infection, endocarditis and death. Bourquin and de Quervain (Thoinot, Sand) relate the case of a healthy man of 35, who made an effort to hold back a heavy cask. He had a sudden pain in the chest, and next day he spat up bloody mucus; he became worse and developed cyanosis, rapid pulse and a mitral murmur. Death occurred seven weeks after the accident from cerebral embolism. The autopsy showed ulcerative endocarditis and a septic embolism in the brain.

Chronic endocarditis frequently follows the acute form, and it is also due to various diseases, such as syphilis, gout, rheumatism, alcoholism, plumbism, and long and continued severe muscular exertion.

Chronic endocarditis and consequent valvular disease of the heart is recorded as a sequel to injury. In some of the recorded cases an examination of the heart immediately after the injury revealed no disease, yet within a month and a half a murmur was evident, as in the case of Ritter (Thoinot). L. Heidenhain (Thoinot) relates the case of a healthy sailor who was struck on the chest by the handle of the capstan. The accident occurred in May, 1884, and he did some work up to June. In November he had distinct aortic disease. The diagnosis was traumatic endocarditis.

Tegeler (*Aerztliche Sachverst Zeit*, Jan., 1906) relates the case of a man, 37, in good health, who, in falling, struck his chest against a rail. He continued work, but left off the next day, and returned after six weeks. In another six weeks he left work again ; six months after the accident he had a rapid pulse, and two months later a systolic murmur. Two years after the accident he had all the symptoms and signs of mitral insufficiency.

Injury may aggravate a heart lesion by rupturing a valve, by interference with muscular compensation, by provoking endocarditis. A violent effort may aggravate it ; so also may fright. The aggravation may be sudden, or it may be gradual and progressive (Thoinot). (*See* **Heart.**)

ENTERITIS.—Inflammation of the intestine. Intestinal catarrh. Usually caused by improper food, irritant poisons, infectious diseases, diseases of heart, lungs, liver, kidneys, &c., extension of inflammatory processes in the abdomen. It may be acute or chronic. The symptoms are diarrhœa, possibly passage of blood and mucus, colic.

Injuries to the abdomen, which just fall short of causing rupture of the viscera, may produce lesions of the mucous membrane, which produce blood-stained or tarry (altered blood) motions. Traumatic enteritis may become chronic (Sand).

EPILEPSY.—A chronic disease associated with convulsions and loss of consciousness. A mild form is recognised in which attacks of giddiness take the place of the convulsions. It is also called " petit mal " in contrast to the severer form, " grand mal " or " haut mal."

Epilepsy is a common affection, and is believed to have, as predisposing causes, alcoholism, heredity, syphilis, injuries at birth, intermarriage of neurotics ; as exciting causes, fright, head injuries, fevers, sunstroke, syphilis, pollution, &c. ; as reflex causes, worms, lesions involving the peripheral nerves, dyspepsia, &c.

The idiopathic is the variety which has a primary, not a traumatic, origin. It begins commonly between the ages of ten and fifteen. The varieties which follow traumatism are traumatic epilepsy, Jacksonian epilepsy, traumatic reflex epilepsy.

Traumatic Epilepsy occurs after head injury, usually a fall or a blow, fright also plays an important part ; there may in this variety be no visible or recognisable brain lesion other than the epileptic fits. The convulsions may develop immediately or within twelve months ; if they develop later they are less certain to be of traumatic origin.

Jacksonian Epilepsy.—This is the most frequent form of traumatic epilepsy. In this there is usually a fracture of the skull causing indriven splinters of bone to irritate the brain, or there may be an ingrowth of bone as a sequence to injury without fracture, or again there may be inflammation and adhesion of the brain and its membranes, or the formation of an inflammatory or malignant growth.

There may be after the injury, weakness or paralysis of the muscles presided over by the brain centre involved. Twitchings begin generally in these groups of muscles, and eventually become general convulsions or fits, but they may remain localised for a long period. The fits may immediately follow the injury, or after a period varying from months to years—even as long as five, ten or more years. In this interval before the appearance of the first fit, the patient may have been perfectly well, and apparently have recovered from the original injury ; on the other hand there may have been frequent headaches or paralysis of a group of muscles. The course of the disease is progressive, but a certain number of cases of Jacksonian epilepsy seem to be amenable to operative treatment, which is the only treatment affording a reasonable hope of cure. The disease in itself is not directly fatal, but it renders the subject extremely liable to accidents of all kinds, and unfits him for work where his attacks of unconsciousness would endanger his own life or that of others.

Traumatic Reflex Epilepsy.—In this convulsions are referable to injuries at the periphery of the body. Franco-German war records show seventeen cases of epilepsy amongst 77,461 persons wounded in the trunk and extremities. These cases are rare, and Bailey states that he has never made the diagnosis of traumatic reflex epilepsy. Weiss relates a case in *Wiener Klin Wochnschr*, 1894, vii, 17, due to the presence of an exostosis after a fracture of the right leg. Siemerling (Bailey) says the disease may be found after injuries to the scalp, causing fixation of the cicatrix, also after injuries about the neck and to nerves. Cures are said to have followed excision of the irritating scars. After epilepsy, due to injury, insanity may come on, or an injury to an epileptic may provoke this; the patient may be maniacal with suicidal, homicidal, thieving or incendiary impulses, and he may become totally demented.

On the question of the relation of any of the forms of epilepsy to injury, it is necessary to find out if there were previous epileptic attacks, and to avoid a misjudgment it is advisable for the medical reporter to see the attack or to be satisfied that the patient's medical attendant is not deceived.

Valuation of incapacity according to Becker: If the attacks are of daily occurence the incapacity is total. If they occur at intervals of two or three weeks they prevent work only under certain dangerous conditions; then the figure will be about 50 per cent. If the attacks become rare the figure will come down to 30 or 25 per cent. according to the nature of the work and the frequency of the attacks.

EPIPHYSIS.—A portion of bone, which in the young is separated from the shaft (diaphysis) or main body of a bone by a piece of cartilage; this cartilage eventually becomes converted into bone, and at the age of twenty five all the epiphyses are solidly united to their contiguous bones, and are not liable to separation. Epiphyses may be damaged by injury, separated from their diaphyses, or inflammation of a septic or tuberculous nature excited.

The following are the most frequently injured epiphyses according to Poland. Union takes place to the various shafts as follows: The three bony centres (head, great and lesser tuberosity) for the upper epiphysis of the humerus unite to the shaft at from the twentieth to the twenty-fourth year; the lower has also three centres (capitellum, trochlea, external epicondyle), and unites with the shaft at seventeen years of age; the internal epicondyle of the lower end of the humerus is a separate centre, and it joins on to the diaphysis at from the eighteenth to the twentieth year; the lower epiphysis of the femur unites to the shaft at about the twentieth year; the acromion process of the scapula unites at from the fourteenth to the sixteenth year; the lower epiphysis of the femur unites at from the twentieth to the twenty-third year; the upper epiphysis of the tibia unites at from the twentieth to the twenty-second year, and the lower at about the eighteenth or nineteenth year.

Injuries, or separation of epiphyses, may cause cessation of growth and consequent shortening of the bone, but if reduction can be effected the results may be very good. If the displacement remains unreduced, very severe disability will ensue. Acute inflammation of an epiphysis (epiphysitis) may occur; it is probably due to micro-organisms from the blood becoming localised or arrested by trauma or other cause. It is a serious disorder, and frequently ends in abscess, necrosis and the formation of discharging sinuses, suppurative arthritis with the destruction of the joint, anchylosis, atrophy of muscles, and diminution in the working value of the limb.

EPITHELIOMA.—Epitheliomatous cancer or ulceration of the skin or of the corneal surface of the eye due to pitch, tar or tarry compounds. (*See* also **Acne. Cancer.**)

Continued irritation by tar and its congeners may produce an inflammation of the skin (erythema), and this, taken with the blocking of the ducts of the skin glands (tar acne), may cause the skin to become warty ; when these warts break off an ulcer is often found underneath, this may heal up or it may assume a malignant character. These growths occur on the face, hands and scrotum of workers engaged in the handling of compounds of tar, such as making briquettes or unloading pitch, &c. These substances readily penetrate the working clothes, so that strict cleanliness is a useful but not an absolute preventive.

The pitch may strike the eye and cause an ulcer, which may heal up leaving a scar which may obstruct the vision, or the ulcer may perforate the eye and destroy it.

These epitheliomatous ulcers are dangerous, and the sooner they are removed by operation the better. Scheduled. (*See* **Pitch.**)

ERYSIPELAS.—An infectious, contagious inflammation of the skin. The disease is of bacterial origin, and may enter the skin through a slight abrasion. There may be suppuration or even gangrene of the affected part.

Erysipeloid (Rosenbach) is a form of infective inflammation of the skin which attacks butchers, cooks, and those persons who have occasion to handle dead animals. The infection enters through a minute breach in the skin. It usually tends to get well rapidly.

EXAGGERATION.—Claims for compensation after injury appear to fall naturally into three classes—genuine, exaggerated, fraudulent. On the question of exaggeration it must be obvious that even a genuine claimant will hardly be expected to relate the account of his injuries and the story of his symptoms without, at all events, endeavouring to fully impress on the medical examiner the reality of the claim. In such a case there will have been an actual accident and positive injury, and if he does lay what appears to be undue weight on any of his symptoms it is very often on that one which is least important from a pathological point of view. This amplification of real symptoms is strictly speaking reprehensible, but frequently *bona fide*. It mostly expresses the lines on which the patient's fears for his future run. Such an amplification or over-statement is a totally different matter to the exaggeration which comes close to imposture. In giving careful consideration to the narrative of the patient's sufferings, it is well to remember that it is not in accordance with scientific precepts to put down to exaggeration or fraud symptoms which we are unable to explain, and that it is quite possible for even the youngest medical man to make a mistake. We may, then, guardedly speak of two kinds of exaggeration: (*a*) the involuntary, an exaggeration which is part of the hypochondriasis and neurosis that accompany injuries; (*b*) the voluntary, an exaggeration which is deliberate, and which is capable of being demonstrated as fraudulent. (*See* **Malingering. Provocation. Substitution.**)

EXOSTOSIS.—A bony outgrowth projecting from a bone. It is not a true bony tumour. Exostoses occur as enlargements of the bony parts where tendons are inserted as in the attachment of the adductor magnus muscle on the inner side of the thigh. They are also of frequent occurence as a diseased condition at the nail of the great toe. They may follow injury, and show themselves within two months at the injured site. Exuberant callus (q.v.) after a fracture may be an exostosis, and produce pressure on muscles, vessels or nerves, and by interference with functions require operative removal.

EXTRA UTERINE PREGNANCY.—An unusual case of this is reported by Tissier and Souligoux in the *Presse Medicale*, Paris, January 2nd, 1907. A woman, twenty-five, pregnant eight months, was knocked down by a locomotive, fracturing shoulder and ribs. The fœtal movements ceased, menses reappeared accompanied by painful crises. Laparotomy showed the fœtus free in the abdomen secured only by an omental band. The eight months fœtus had the head bonneted by the placenta surmounting the torn uterus. There was neither hæmorrhage nor peritonitis, probably because the placenta made some sort of a tampon on the uterus. The fœtus was covered by the membranes.—*Bulletin Medical des Accidents du Travail*, February, 1907.

EYE. (*See* **Appendix** for special article on Diseases and Injuries.

FACIAL NERVE (Seventh Nerve).—The deep origin of this nerve is in the floor of the 4th ventricle of the brain, and it appears on the ventral surface of the pons (the bridge of nerve fibres which connects the cerebrum, cerebellum and medulla oblongata). It passes forward and outward, and enters the internal auditory meatus with the auditory nerve; then, following the windings of a bony canal (aqueductus Fallopii) in the base of the skull, it appears close to the angle of the jaw and passes forwards to supply the muscles of the face. The nerve may be injured in fractures of the base of the skull which involve the aqueduct. Facial palsy may be an associated sign of an apoplectic seizure. In facial palsy of central origin the upper branch of the nerve is not always involved, and there remains a large amount of power to close the eye and wrinkle the forehead. If the palsy is of peripheral origin the eye cannot be closed nor the forehead wrinkled. The affected side of the face is flat, smooth and expressionless; when the patient laughs the healthy muscles of the unaffected side of the face drag on the paralysed ones, and deformity is produced. This condition is well known as "Bell's palsy." It may be caused also by syphilis, rheumatism, gout, exposure to cold. A great many of these non-traumatic cases recover. The deformity in itself can hardly produce incapacity for work, but serious eye trouble may arise, by reason of the patient's inability to close the eyelids, and thus irritating dust may enter and set up inflammation which may destroy vision.

Operative junction with the hypoglossal nerve may sometimes effect a cure of the severer forms of the paralysis, but a perfect recovery is not common (Sherren).

FEMUR.—The thigh bone, the largest and also the strongest bone in the body. It is made up of a shaft and two extremities. The upper extremity ends in a head which fits into the hollow in the haunch bone and forms the hip joint ; this head has also a neck, which is placed at an obtuse angle with the shaft. The greater and lesser trochanters are masses of bone placed at the outer and inner sides of the neck, where it joins the shaft. The lower end is another thick mass divided into inner and outer condyles by a notch, the intercondyloid notch. These, with the upper end of the tibia, form the knee joint. Dislocations may occur at either end, and fractures at any part of the bone. Dislocations may be simple, in which case they are readily reduced, or they may be accompanied by fractures, and then the injury is much more serious. If they are irreducible they may produce almost complete incapacity. (*See* **Unreduced Dislocations.**)

Extra capsular fractures, that is fractures outside the hip joint, often recover, with the development of a considerable amount of callus formation. Intra-capsular fractures occur mostly in elderly people, often from very slight violence ; in this form there is less callus formation. The fractures may be impacted, that is the broken ends driven into each other, or they may be non-impacted. They generally require from two to six months for recovery, and there is nearly always some shortening of the limb, and probably lameness. Fractures of the shaft, if simple, recover well in three to four months. There will be frequently shortening, and possibly a little eversion of the limb. If there is much angularity or overlapping, operative treatment may be required ; if any of these fractures are compound, and if they become septic, amputation may be required. Non-union, and consequent false joint, may occur and produce great incapacity. Contusions about the hip may produce laxity of the soft parts and weakness and instability in the joint; the muscles may atrophy. Rupture of the muscles may take place and require an operation before the limb can be of service for hard work. Anchylosis and unreduced dislocation may be valued at about the same figure, the incapacity being nearly the same, 70 to 90 per cent.; fixation in the straight position, 50 per cent.; at an angle, 58⅓ per cent.; atrophy of muscles of hip joint, 33⅓ per cent.; union in a deformed position of the thigh and leg, with shortening of the limb, 25 to 66⅔ per cent. A neuritis, or a nerve injury accompanying these, would require an increase of 25 per cent. (Rohmer).

Fracture of the lower end, if through the condyles, may involve the knee joint. The fracture may also occur above the condyles, and result in considerable disability and deformity. Dislocations are usually readily reduced, and get well in two to four months, but if the ligaments are extensively ruptured the joint may remain weak. Complicated compound dislocations or fractures at the knee joint are very grave injuries; amputation may be required to save life, or there may be a permanent anchylosis of the joint.

Fractures, if they can be reduced into good position, will usually be recovered in about four months. The valuation of the incapacity, according to Rohmer, is: For relaxed knee joint, 58⅓ per cent.; anchylosis in extension, 41⅔ per cent.; anchylosis at an angle, 50 per cent.; atrophy of muscles of the leg, 33⅓ to 50 per cent. (*See* **Lower Limb.**)

FIFTH NERVE (Trigeminus).—A nerve of motion, sensation and taste. It is distributed to the eye, skin of face, tongue and teeth. The symptoms of injury to it are pain or anæsthesia in the area of the branch or branches affected. The first division (ophthalmic) may suffer in injury or disease of the anterior fossa of the skull. The cornea becomes anæsthetic, and destruction of the eye may result. If the motor portion is injured there will be paralysis of some of the muscles of the lower jaw. A severe form of neuralgia may follow injury to the divisions of the nerve such as may occur in fractures of the base of the skull. The condition may be relieved by a severe intracranial operation.

FINGERS.—Dislocations, fractures, and other injuries occur.

Dislocation of the **proximal phalanx** of the **thumb backwards** is a frequent dislocation. It is difficult to reduce, and it may often recur and require operation. This recurring dislocation renders the hand very unreliable.

Dislocations of the **carpo metacarpal joint** are common. They are usually readily reduced, but impairment of function for a long time is frequent. Other dislocations of the fingers have not so serious a significance.

Simple fractures of the fingers usually get quite well, but if there is impaction the functions may be interfered with. Compound fractures and dislocations may result in great disability. Simple wounds of tendons generally do well if sutured early, and the wound does not become infected. Infection may cause the tendons to slough, and anchylosis, contracture, or loss of the finger occur.

Bennett's fracture at the proximal end of the metacarpal bone of the thumb may be difficult to retain in position, and there may result disability and weakness of the thumb for grasping.

Foreign bodies, such as needle, glass, &c., may be embedded in the soft tissues, and cause pain during movement.

The fingers have not all the same value in the regular functions of the hand.

The **thumb** is by far the most important, and the real usefulness of the hand to a workman depends largely on the absolute integrity of this digit. The **index** comes next. In it there is developed an unusual degree of tactile sensibility, so that its loss deprives the subject of a highly valuable organ of touch; it also acts with the thumb as a grasping instrument like tongs, and its loss impairs this power of the hand. Stumps which may be left after injury are always useful. **Depreciation after total loss of the thumb** is valued at 25 to 30 per cent.; **anchylosis** of the joints according to the nature of the work required, 25 to 33 per cent.; after **total loss of the index,** 16 to 25 per cent.; **anchylosis** of the joints, 8 to 25 per cent., according to the work. The **loss of a single one of the phalanges of the thumb** is a serious one. Anchylosis is not quite so serious, but a stiff thumb may impede the work of the hand. The **loss of one or more phalanges of the index** will be from one-third to two-thirds of the total loss of the index. **Anchylosis of the terminal phalanges of the index** hardly causes any depreciation. **Anchylosis of two** is about two-thirds of the loss of the finger; of **three** about equal to total loss, and the digit may be fixed in a very inconvenient position and interfere with a man's duties. Loss of the terminal phalanx of the middle, ring and little fingers occasions very little incapacity. The **loss of the middle finger** is regarded by Golebiewski as of more importance than the index, but most authorities think that it is not of as great value as the index. Be that as it may, it is certain that the loss of the middle finger is a great loss, and that it is specially important if the metacarpal bone is also lost or the transverse metacarpal ligament severed; then the grasp is much weakened, and the general usefulness of the hand diminished. The estimation varies from 8 to 16 per cent. (Rohmer). The **loss of the ring finger** is of somewhat less importance than the middle, and its valuation is just under it. The same applies to the **little finger.**

The chief functions of the fingers are prehension—a grip with finger and thumb, which is required for delicate work such as writing, engraving, sewing, or holding a nail,

&c. ; a grip with the thumb and fingers is also required for the direction and manipulation of tools.

The joints of the fingers may be afflicted and crippled with arthritis deformans after injury. Tuberculosis and tumours may arise in the bones after injury to the fingers. (*See* **Bone. Cancer.**) Infective wounds on the fingers are liable to cause suppuration and serious interference with functions if they spread into the palm of the hand, as they are very prone to do. (*See* **Panaris.**) Contractures (q.v.) frequently follow injuries to tendons. Certain neuroses affect the fingers, such as writers' cramp, &c. (*See* **Cramp. Telegraphists' Cramp.**)

FIRST NERVE (Olfactory. Nerve of Smell).—This nerve rests on and passes through the cribriform plate in the front part of the base of the skull, and the filaments are distributed to the interior of the nose. The nerve may be injured by blows on the nose, back of head, penetrating wounds of the frontal or nasal region, fractures.

The patient usually complains of inability to taste, less often of the loss of smell (Sherren). Sand relates the case of a wine merchant who lost some of his sense of smell (anosmia) following a blow on the nose ; this caused him difficulties in the purchase of his wines, and he was compensated (10 per cent.). He also mentions the case of a gasfitter who suffered injury to his nose, and was unable to recognise the escape of gas.

FISTULA.—A suppurating channel opening into an internal organ. **Anal fistula** is a fistula opening into or near the anus. This may be traumatic, and follow a contusion. Tuberculous patients are liable to anal fistulæ, and an injury may readily hasten their development. It also seems possible, and even probable, that a patient who is the subject of a quiescent tuberculous deposit, in the ischio rectal space, and who receives an injury there, either by a blow or by falling astride a beam, &c., causing the development of an anal fistula, may also by the same injury have the tuberculous deposit disseminated through his system, and die later from the disease in the lungs, brain, &c. A fistula in ano caused by injury may be curable by operation, but if there is a tuberculous subsoil the case may be quite inoperable. Various other fistulas are known to occur after injury, such as gastric fistula, lacrymal fistula, urinary fistula, fæcal fistula, &c.

I have recently seen a case in which a fall astride and separation of the legs was alleged to have caused an ischio rectal abscess. The ultimate result was a hard scar involving the external sphincter ani, with atrophy and considerable weakness in sphincter control and some prolapse of the bowel mucous membrane. The patient was totally incapacitated.

FOOT. (*See also* **Ankle**).—The foot is made up of the tarsus (seven bones named the astragalus, calcaneum or os calcis, scaphoid, cuboid and three cuneiform), and the metatarsus consists of five, shafted bones jointed behind to the tarsus and in front to the toes. The toes consist of fourteen bones, two in the great toe and three in each of the others. Sesamoid bones are minute bones developed in some of the tendons, which work over a bone. Two movements of the foot in full working order—extension and flexion—are requisite for walking and standing without fatigue. The other important movements are: rotation on a vertical axis, eversion and inversion, drawing up of inner and outer border, flexion and extension of the toes. These are of great value in such movements as climbing a ladder and holding the foot on the ground in order to make or sustain a sudden effort, &c. The vastly important parts of the foot are the heel and the ball of the big toe, for these form the supports of the anteroposterior arch of the foot. The transverse arch of the foot is dependent on the roughly triangular shape of the middle and external cuneiform and 2nd, 3rd and 4th metatarsal bones. The apices of these are towards the sole, the bases towards the dorsum. These arches are maintained by dense, strong ligaments and a powerful plantar fascia. Muscles also take an active part in sustaining these arches, and for the foot to be at its full working value it is necessary that they should be vigorous and healthy.

Fractures and dislocations of the several bones may occur. (*See* **Astragalus. Calcareum. &c.**)

Wrenches and Sprains may cause incapacity, and they are frequently associated with fractures, as in the *pied force,* in which there may be fracture of two or three metatarsals. This condition is also believed to be due to periostitis (Boisson and Chapotot).

Simple fractures of the first and fifth metatarsal occur, and there is often a considerable amount of swelling with great pain. It will be from two to four months before the foot can be used without some discomfort (Scudder). When the injury causes prolonged interference with full working capacity, the disability is estimated by Fargues at 20 to 25 per cent.

Fractures of the other bones—cuboid, scaphoid and cuneiform—are usually the result of direct injury, and there will then be associated with them extensive contusions of the soft parts, and the incapacity will be measured by the pain on bearing weight, together with the objective evidence of damage and the ultimate amount of limitation in movements.

Dislocations of the bones of the metatarsus may occur. They closely resemble fractures in their symptoms and late results. Dislocation of the tendon of the peroneus longus muscle from behind the external malleolus is rare. Still rarer is the dislocation of the tibialis posticus. These may cause disability, requiring operative treatment and care for several months.

Effusion of serum or blood after injuries may occur in the tendons (peroneal, tibial), and there may also be acute **inflammation of the achilles tendon** caused by sudden over-extension of the foot. These are painful, persistent conditions likely to recur. (*See* **Calcaneum.**)

Perforating ulcer of the foot is a condition in which an ulcer on the sole of the foot perforates deeply to the muscles and between the bones. Excision or amputation may be required. This disorder may arise from embolism, which latter may have as a cause sudden effort, a blow, &c. It frequently arises without injury, and is closely related to senile gangrene. It may also be associated with diabetes, or have a cancerous, septic, or neuropathic origin.

Simple fractures and dislocations of the toes usually get well rapidly. Wounds are prone to become septic. This may spread into the foot and disorganise it ; in old persons even gangrene may ensue.

Scars after injuries to the foot or toes are sometimes placed in such a position that pressure by the hard boot of the working man causes great pain and incapacity.

In total loss of the foot at the ankle the incapacity is estimated at 66⅔ per cent. Partial loss may cause almost the same disability, and this will be more likely if from any cause it has been impossible to carry out removal by one of the classical operations of Syme, Chopart, Lisfrane, or such operations as will have left a painless scar well removed from the risk of pressure. Valuation of incapacity after loss of the great toe is estimated at 10 to 20 per cent. (Brouardel) (16⅔ per cent. Rohmer). The depreciation by loss of all the toes is valued by Rohmer at 50 per cent. If there is, in addition, a loss of the metatarsal bone, the incapacity is increased by 5 to 10 per cent. The loss of a single toe, other than the great one, may not cause any incapacity, nor will the loss of a single terminal phalange from one or several toes if the wounds are healed with healthy, painless scars.

Flat foot.—A condition in which the arches of the foot are flattened. In this the inner aspect of the sole from the heel to ball of great toe comes down into contact with the ground. Other alterations in the relations of the bones take place ; the internal malleolus is more prominent, and the calcaneum and astragalus show an inward obliquity. Such alterations are necessarily associated with pain, which is usually referred to the centre of the sole, but sometimes to the front of the external malleolus. Flat foot may be congenital or acquired ; the acquired form may arise in a weakly individual from prolonged standing. Rickets is a frequently predisposing element. It may also follow fracture or dislocation of the tarsal bones, a wrench or strain, lesions of the tibialis anticus and peroneus longus muscles. The traumatic form is usually unilateral, the congenital bilateral. Tracings or impressions of the sole will show the extent of the disorder. They are more particularly useful if one foot only is affected, but it must not be overlooked that in congenital flat foot the condition in one or both can be aggravated by injury.

Sometimes a patient suffering from a traumatic flat foot which is very painful, may, in order to relieve it, overwork the other, causing in it a similar condition, and thus a secondary flat foot is developed in the non-injured side (Hoffa, *Congres Liege*, 1905).

A **traumatic form of talipes varus** occurs (Hoffa). In this deformity the patient walks on the outer border of the foot, the sole being turned inwards. It has followed fractures of the malleoli, fractures and dislocations of the bones of the tarsus, dislocations of the calcaneum, paralysis, &c.

In **fracture of the three middle metatarsals** a condition of varus may persist for a time and cause very considerable depreciation in the usefulness of the foot. (*See* **Talipes.**)

FOURTH NERVE (Trochlear).—This nerve passes round the crus cerebri and forwards to the outer wall of cavernous sinus, and enters the orbit through the sphenoidal fissure to supply the superior oblique muscle of the eye. Injury to this nerve alone is very rare. If it does occur the superior oblique muscle may be paralysed. The symptoms will be diplopia (seeing of single objects as two) while looking down, slight convergent squint ; the affected eye fails to follow an object moved downwards. It may cause difficulty in walking and writing and giddiness in going downstairs. It may also be a symptom of neurasthenia, rheumatism, gout, diabetes, lead poisoning, alcoholism, meningitis, tumours of the brain.

FRACTURES.—A fracture is a solution of continuity in a bone. It may be simple, in which the bone *alone* is injured; compound, in which there is an open wound leading to the fracture; comminuted, in which the bone is broken into splinters; complicated, in which there is associated damage to the structures in the neighbourhood of the fracture. Fractures may be complete or incomplete; complete when the bone is fully broken through, incomplete when the bone is broken and the periosteal covering is intact (subperiosteal fracture), or when the bone is merely bent, only one side of the bone being broken (greenstick fracture).

The line of fracture may be transverse, oblique, longitudinal, spiral, T-shaped. The broken ends may be dovetailed or wedged (impacted fracture), or they may be overlapping (non-impacted fracture).

A depressed fracture occurs in the skull. The broken piece is driven below the surface, and may or may not penetrate the structures underneath.

Fracture by *contre coup* is a fracture of one side of the skull, caused by a blow on the other side.

The signs and symptoms of fracture are briefly—pain; swelling; loss of power; increased mobility of the part; deformity, which if reduced recurs if no restraining apparatus is used; crepitus, q.v. (*See* **Bone.**)

GANGLION.—This usually refers to a cystic tumour which occurs in tendons. It appears on the back of the hand and wrist, on the palmar side of wrist, and also on the foot. It may be small or large, and is a soft, fluctuating, but occasionally hard tumour. The contents are mostly gelatinous, and sometimes bodies like rice or melon seed are present. It arises as dilatations of tendon sheaths, which protrude through traumatic or preformed slits in the annular ligament or above or below it. This form may ensue suddenly after a sprain. Other forms arise in the joints of the wrist, foot, &c., and are in the nature of hernial protrusions of the synovial membrane. Another less common form originates in normal bursæ.

According to Ledderhose, true ganglion is a new formation in either tendon sheaths or bursæ. Sometimes, when they are small, they may not cause any inconvenience, but not infrequently they may give rise to considerable pain by reason of their pressure on nerves ; the size also may interfere with the working power of the limb. Sometimes the disease is of tuberculous origin. This is believed by many authorities to be true in regard to the ganglion, which is found on the front of the wrist and palm, and known as a compound palmar ganglion. In this case it will be more slow in its development, but if a tuberculous ganglion is injured the traumatism may accelerate the growth. Sand thinks that traumatism may be admitted as a cause of ganglion if it declares itself in the injured part within six months without other likely cause to account for it. If the condition causes marked incapacity, an operation may give good results, but it is not entirely free from the risk of producing a certain amount of limitation of movements.

GANGRENE.—Molecular death of a part. It may be due to injury by interference with the circulation or cutting off of blood supply ; it may follow the long-continued application of dilute carbolic acid ; it occurs in diabetes, and is also an accompaniment of senility ; it may be a sequence of local asphyxia (q.v.) or septic infection.

Two forms are recognised, the dry and the moist.

Gangrene of the intestine may follow injury, contusion, crush, strangulated hernia, &c. Pulmonary gangrene (gangrene of the lung) may follow injury to the chest; it may also follow pneumonia, cancer of the lung, diabetes, tuberculosis, lodgment of foreign bodies in the bronchi. (*See* **Lung.**)

GASTRALGIA. GASTRODYNIA.—Pain in the stomach. It may be a symptom of injury to the stomach, or of conditions such as gastritis, cancer, ulcer, tabes (gastric crises), neuroses, &c.

GASTRITIS.—Inflammation of the stomach. It may be acute, and be caused by unsuitable food, alcohol, &c., irritant poisons, fevers, diphtheria, injuries.

The chronic form follows dyspepsia, gout, diabetes, chronic alcoholism, ulcer, cirrhosis of liver, &c. It may follow the acute form. (*See* **Stomach.**)

GENERAL PARALYSIS, General Paresis, Paretic Dementia, General Paralysis of the Insane (G.P.I.).—A form of insanity characterised by progressive loss of the mental faculties. The disease lasts from a few months to five or six years, and usually ends in death.

As to causation, syphilis is believed to be the most important underlying contributory cause. The disease is not common before twenty-five or after sixty. The exciting causes are held to be mental excitement, worry, overwork. That trauma can accelerate the cause of the disease there can be no doubt, but that it can originate it in its acute form is an assertion which is open to very considerable doubt. That the disease in its chronic form does follow trauma is a doctrine strongly held by eminent authorities. Plumbism and electric shock have also been noted as causes. The disease is frequently insidious in its onset, and the symptoms in the early or prodromal stage, the "medico legal period" of Legrand du Saulle, may amount to nothing more than slight tremors of the face and tongue, with some indistinctness of speech.

If the patient has an injury during this stage, it is probable that it may produce an immediate explosion of the affection, which will be readily recognised. In such a case the disease is unmasked by the injury. On the other hand the symptoms may appear soon after the trauma, and progress step by step up to full development. Again, a patient may have a severe head injury, and apparent recovery takes place; yet later, after months or years, general paralysis results.

In some of these cases appearing late, from one to six years or even as remote as fifteen years after injury, there may be certain signs and symptoms which will show the connection between the trauma and the disease, and so establish the relation of cause and effect without difficulty. The other group of cases, in which the intercalary period shows an entire absence of symptoms, is an uncommon one, but the thesis of Vallon contains a good number of such (Thoinot). For example (XIII), a fall on the head at forty years of age, general paralysis at forty-seven; no brain trouble during the intercalary period of six years. (X) During the two years which followed head injury no cerebral manifestations; then began a series "d'accidents psychiques," which ended in general paralysis in the tenth year. Again, an observation borrowed from Doutrebente by Vallon: Accident in 1865, cerebral trouble followed; the patient got well, and remained free from any psychic manifestations for thirteen years, from 1866 to 1879. In 1879 there was an attack of insanity, followed soon after by general paralysis. These cases favour the view that trauma may be a cause of general paralysis. Bailey, on the other side, after examining a number of cases, formed the opinion that trauma is rarely, more probably it is never, the only cause of this disease. Kurt Mendel believes that up to the present time there has not been recorded an absolutely proved case of general paralysis of purely traumatic origin.

The symptoms of tremor and indistinctness of speech are often accompanied by myosis (contraction of the pupil) or irregularity of the pupils; the knee-jerks are lost in about, perhaps, one third of the cases; they may be normal or exaggerated. The patients become careless, forgetful, irritable; later they may have delusions of the grandiose type, and commit extravagant acts and have seizures of an epileptic or apoplectic character, hæmatoma of the ear, blurred speech (omission of the last syllable), paresis of muscles, finally pneumonia, followed by death.

Pathologists are not in agreement as to the exact nature of the brain lesion. Formerly it was held that the brain atrophy was of inflammatory origin; now it is more generally held that the disease is a primary atrophy. There is an absolute syphilitic history in 80 per cent. of the cases (Mercier), yet the pathological changes are not syphilitic (Hektoen and Riesman). A bacterial theory has been advanced (Ford Robertson), but it has not been generally accepted.

GLANDERS. Farcy.—A disease due to the presence of *Bacillus mallei*: it occurs in horses, and is communicable to man. The disease develops in man after a period of incubation of three or four days. Grooms, ostlers and stablemen are the persons who are liable to become inoculated, on account of their being likely to be in attendance on diseased animals. The mode of entrance to the human body is by wounds, abrasions, bite of a diseased animal, handling or skinning an infected carcase. An infected animal may cough or sneeze into the eyes or mouth of a person and so cause infection.

The disease is characterised by headache, fever, nodules form under the skin, the nose may ulcerate and discharge, glands enlarge, red pimples form on face and trunk, septicæmia, pneumonia and death occur in from six to twelve days.

The disease may become chronic, but even then the mortality is about 50 per cent. Scheduled.

GLOSSOPHARYNGEAL NERVE (Ninth Nerve).—This nerve leaves the skull with (in a separate sheath) the pneumogastric and spinal accessory nerves. It is in close contact for some distance with the internal carotid artery and jugular vein. It is very rare for it to be injured alone, and as it is a nerve of sensation to the mucous membrane of the pharynx and tonsil, and of motion to the stylo-pharyngeus muscle, as well as of taste, there will be, if it is paralysed, difficulty in swallowing and in speech. Von Bergmann mentions a case of isolated injury; the patient died suddenly from œdema of the glottis.

GLUTEAL ANEURISM may arise from injury, contusion, punctured wounds, &c., of the buttock, which damage the gluteal arteries. The condition is a serious one. In thirty-five cases of gluteal aneurism collected by Fischer (Tillmans), twenty-three were traumatic.

GLYCOSURIA. **Glucosuria.**—Sugar in the urine. (*See* **Diabetes.**)

GOITRE.—Enlargement of the thyroid body (gland), causing a swelling in front of the neck.

Exophthalmic Goitre.—Graves' Disease, Basedow's Disease. A condition of enlarged thyroid, with marked prominence of the eyeballs, anæmia, rapid pulse, mental irritability, weakness, tremor. It occurs between the ages of twenty and thirty, mostly in women. The enlarged and hyper-active thyroid gland produces toxic products which cause the symptoms. The disease usually arises without any definite known cause. Cases of the disease following injury are recorded: Hammerschmidt (*Deutsche militär arztl Zeitschr*, 1903, 10), Vibert (*Les Accidents du Travail*, 1906, p. 574), Tetzner (*Aerztl Sachverst Zeit*, 15th May, 1906, xii, 10). Sand also contributes another: A female, 52, fell on the head eighteen years previously, was unconscious, then delirious, but recovered in several weeks. Soon after there was exophthalmos, frontal headache, palpitation, transitory œdema of feet. The symptoms persisted for seven years, and then disappeared. Eleven years after recovery there remained distinct bilateral exophthalmos, and hysterical phenomena have recently developed.

Remlinger, in *Bull. Soc. Med. Hopit. de Paris*, November 9th, 1900, records a case of exophthalmic goitre following the bite of a mad dog.

Injuries may accelerate the course of the disease, or excite it in a predisposed individual (K. Mendel).

GONORRHŒA.—A venereal disease due to the presence of the gonococcus of Neisser. This organism can usually be demonstrated in the discharge. It is very frequently attended by such complications as orchitis, epididymitis, prostatitis, sometimes endocarditis, and arthritis. The disease is never due to traumatism. An accompaniment of gonorrhœa, which is of not uncommon occurrence, is arthritis, and any injury to a joint in persons the subject of gonorrhœa may cause a gonorrhœal arthritis, or perhaps a gonorrhœal tenosynovitis. Such conditions in joints and tendons are of long duration, and have a great tendency to recur. They sometimes result in limitation of movements or anchylosis. (*See* **Testicle. Urethra.**)

GOUT.—A painful disease of the joints, believed to be due to the presence of an excess of uric acid in the blood.

This disease, which is not a monopoly of the rich or leisured classes, most frequently begins in the joint of the great toe, and usually develops its attack at night. In gouty persons an injury, such as a blow, a dislocation, a fracture, a wrench, or even a fright or shock, can initiate an outbreak, which most often appears in the twenty-four hours following the traumatism, but it may not show itself for a week. In a gouty subject traumatic arthritis may be a troublesome and painful effect of injury; it may also, later on, cause deformity and a considerable amount of incapacity; there may result, finally, partial or complete anchylosis.

HADERNKRANKHEIT.—A disease which affects rag pickers. It is most probably anthrax (q.v.).

HÆMATEMESIS.—The vomiting of blood. It may be due to various causes, such as acute and chronic gastric ulcer, cancer, gastritis, irritant poisons, cirrhosis of the liver, as a complication of abdominal operations, certain blood diseases, fevers, &c., injuries causing rupture of vessels in the stomach, or initiating ulcers. The blood may be derived from the mouth, nose or throat, and have been swallowed and afterwards vomited. A violent effort, by suddenly increasing the intra-abdominal pressure, may cause hæmatemesis; but as a rule, if vomiting of blood occurs after effort, it is almost certain that the stomach has not been healthy. Contusions, blows, &c., of the abdomen may work so much damage to a healthy stomach as to cause hæmorrhage and consequent hæmatemesis, and such injuries will more easily produce this symptom if there be ulcer or any other disease present in the stomach.

Extensive burns are believed to cause gastric or duodenal ulcer, with the attendant risk of hæmatemesis and other complications.

Injury to the œsophagus (gullet) could have as a symptom hæmatemesis. (*See* **Blood. Bowel. Stomach.**)

HÆMATOCELE.—A tumour containing blood. It is used mostly in reference to the effusion of blood into the tunica vaginalis, or pouch which invests the testicle (q.v.).

Hæmatocele of the spermatic cord (q.v.) or tunica vaginalis may occur after heavy lifting, effort (Thiem) or direct injury, and may also follow severe injury to the testicle. An injury to the tumour in a patient suffering from hydrocele (fluid in the testicular pouch) may cause rupture of a blood vessel, and thus a hydro-hæmatocele may form.

Injury to the abdomen or pelvis may cause effusion of blood into the pelvis, and result in a pelvic hæmatocele.

HÆMATOMA.—A tumour containing effused blood. It is seen frequently in the scalp after blows on the head. Hæmatoma auris is a blood tumour of the ear, common in the insane.

HÆMATOMYELIA.—An effusion of blood on or inside the spinal cord. It may follow sudden effort, concussion, injuries of the cord, blows, compressed air work. It is a serious condition, which occurs suddenly; the patient may get well, but incurable disease, such as paralysis or ataxic walk, anæsthesia, persistent pain in the back, may result. (*See* **Syringomyelia.**)

HÆMATURIA.—Blood in the urine. (*See* **Blood. Kidney. Urine.**)

Blood in the urine may come from the kidney as a result of congestion or acute inflammation, tuberculosis, abscess, cancer, malaria, leucæmia, purpura, hæmophilia, scurvy, filariasis, distomiasis, affections of the blood-vessels of the kidney, poisoning by such substances as turpentine, carbolic acid, cantharides. It may be caused by a stone in the kidney. Injuries to the kidney will cause hæmaturia. Blood in the urine may come from the ureter (the tube which conducts the urine from the kidney to the bladder) as a consequence of trauma, or the passage of a stone down it.

Hæmaturia may be caused by disease of the bladder, such as cystitis, ulcer, either tuberculous or cancerous, injuries. It may also be a symptom of diseases of the urethra and prostate, calculus, gonorrhœa, passage of instruments, injuries. Blood may be present in the urine in such small quantity as to be discoverable only by centrifugalisation and examination of the sediment with a microscope; in larger quantity in the urine it may cause it to have a "smoky" appearance; in still greater quantity there may be all the characteristics of recent blood present.

HÆMOPTYSIS.—Spitting of blood. The usual causes of hæmoptysis are diseases of the lungs, especially phthisis, and of the heart, aneurisms and tumours in the thorax, blood diseases, fevers, hysteria, malingering. (*See* **Blood.**)

It seems possible, if the theory that effort increases the intra-thoracic pressure be accepted, that a sudden extraordinary effort may produce an attack of hæmoptysis in a lung which is believed to be healthy. That it can cause it in a lung which is the seat of an active or ancient tuberculosis must be admitted. In phthisis (consumption) even slight effort or strain will initiate an attack, but in this disease profuse hæmorrhage may set in without any strain being noted. A similar attack of blood-spitting may take place in the course of cancer, aneurism, &c. If healthy lungs are submitted to a sudden great increase of intra-thoracic pressure, and hæmorrhage occurs, the hæmoptysis will, theoretically, take place immediately after. Direct injuries to the chest will be, according to their severity, likely to damage the lung and bring on hæmoptysis, as they may also cause traumatic pneumonia and its associated blood-stained sputum. Sudden effort, contusions, &c., can aggravate the various diseases of the intra-thoracic organs. (*See* **Lung. Phthisis. Pneumonia.**)

HALLUX.—The great toe.

Hallux Rigidus.—The toe is fixed either in a straight position, or there may be flexion of the first and extension of the second phalanx. It may arise from strains, crushes, fractures. It is often very painful.

Hallux Valgus.—A displacement of the great toe in the direction of the other toes: it is usually caused by the pressure of boots. Commonly, the head of the metatarsal bone becomes covered with a bursa by the pressure; this thickens and inflames, and a **bunion** is formed. The condition can follow a fracture of the metatarsal bone of the great toe. It is a painful and incapacitating condition.

Hallux Varus.—A displacement of the great toe inwards and away from the other toes. It is usually a congenital affection, and is often associated with knock-knee and flat foot. It may follow fracture.

These conditions frequently give excellent results after operative treatment.

HAND.—It consists of a number of bones grouped in the carpus, metacarpus and fingers. (*See* **Carpus. Fingers.**)

The depreciation in working capacity produced by injury will depend on the structures injured. The hand may be weakened after an attack of hemiplegia, or the wasting of its muscles may be a sign of chronic disease in the central nervous system, or injury or disease in the nerves supplying the muscles.

The **dynamometer** is a most useful instrument for measuring the grasping power of the hand, the comparison being made with the uninjured hand or a normal hand.

Total loss of a hand is a serious disability, but if the stump is sound and not painful, and the nature of the employment will permit the use of an artificial hand or a hook, the limb will develop a remarkable amount of usefulness in time.

A paralysed hand will equal in its incapacity total loss. Estimates of incapacity for total loss of right hand vary from 50 to 75 per cent. ; for the left, 33 to 60 per cent (Rohmer). Loss of both hands, 100 per cent.

In partial loss of the hand its usefulness will depend on the parts left. If fingers and thumb are removed, then the incapacity will closely approach that produced by total loss ; if the thumb alone is left it can act as a hook, and some little grasping may be done ; if a thumb and finger remain a wonderful power of accommodation will sometimes be developed.

HEAD INJURIES (*See* **Brain**).—Clinton Dent, in an article on "The After-Effects of Injuries" (*Clinical Journal*, October 7th, 1908), after emphasising the truth of the time-honoured maxim that "no injury to the head is too trivial to be despised or too serious to be despaired of," quotes the inquiry of English on cases classified under cerebral concussion, contusion and laceration, without evident fracture. In one half there was recovery without after ill-effects; 10 per cent. showed marked mental impairment.

Dent's own experience is less favourable, and as he has had special knowledge of a picked body of men, the Metropolitan Police, his opinion is of great value. He explains the bad late results among them by the fact that the injury is sustained under trying and exciting conditions, intensified by the necessity for strong control, the responsible nature of their occupation, and that it involves night duty and solitary work. The symptoms begin after an interval of rest and apparent recovery with insomnia, difficulty of concentration of thought, impaired memory, irritability, depression, melancholia, and incapacity for duty. The point which he wishes to make clear is that in persons who are required to be fully conscious of the important nature of the duties entrusted to them, and whose nervous systems are liable to sudden intense strains, a head injury which would be considered slight may have as a result after-effects which are serious. The more severe head injuries—fracture, laceration, &c.—will usually afford evidence of their presence by localising and other signs, and will be recognised as serious from the onset. English obtained late records as to working capacity in 164 hospital patients. He found 115 doing the same work at practically the same wages; nineteen were doing lighter work; eleven were only able to do light work; ten engaged in such work as required mounting ladders, cabmen, &c., had given up their trade on account of dizziness; nine were totally disabled. The conditions which are recognised as following head injuries are cerebrasthenia, insanity, cerebral lesions.

Cerebrasthenia is a mental debility or nervous ill-health, which may be coincidental with repair processes after injuries to the head, or it may be a permanent result of these. It causes incapacity for a considerable time, and may prove to be the forerunner of serious disease producing total incapacity. It is characterised by headache, which is often described by patients as tight bands of constrictions, pressure or dull pain ; the latter is sometimes referred to one spot, suggesting a localised focus of disease. The characteristic symptoms and signs are dizziness, sometimes with nausea or fainting attacks, irritability of temper, inability to concentrate attention, loss of memory, lessened tolerance for alcohol, insomnia, and a general diminution in the powers of endurance. These symptoms are largely subjective, and it is necessary to give careful consideration to the possibility of simulation.

Genuine headache in these cases will often be accompanied by the appearance of illness, by congestion or pallor of the face, possibly by inequality of the pupils. The insomnia usually produces some loss of flesh. Observation in hospital will settle the question of the genuineness of the symptoms. Vertigo (q.v.), loss of memory, cerebral fatigue, slowness of the thoughts, change in character, are all conditions and symptoms on which an opinion can be formed if careful observations are taken. The knee-jerks may be exaggerated, and, if so, this will give an indication of the increased excitability of the nervous system.

Traumatic insanity. (*See* **Insanity.**)

Cerebral lesions. (*See* **Brain. Neurasthenia. And the various organic brain diseases.**)

HEALING.—The union of wounds and the restoration of wounded parts.

Healing by first intention is the primary union of wounds without suppuration and without fever. It is necessary for this that the wound should be surgically clean and the parts kept at rest. The healing process occupies about seven days.

Healing by second intention is healing by the cohesion of granulating surfaces and the presence of suppuration. This healing by secondary intention usually occurs in infected wounds, and the length of time required is dependent on the extent of the wound and the intensity of the infection.

A third form of healing is sometimes described : it is known as **healing under a scab or crust.** The scar formed after healing by first intention is small, narrow and insignificant ; that after healing by second intention is broad, and sometimes shows a great tendency to contract. The scar tissue never fully replaces in its structure the normal tissues. It is sometimes very weak, and may yield to continuous pressure, as in the ventral hernia, which occurs after surgical or accidental wounds of the abdomen. (*See* **Cicatrix.**)

HEART.—The muscular pump which maintains the circulation of the blood. It contains four cavities and five valves, and is enclosed in a seromembranous bag, the pericardium. It weighs from eight to twelve ounces. The apex beat of the heart is felt between the fifth and sixth ribs on left side, 3½ inches from the middle line of the breast bone (sternum).

The heart is liable to suffer from many diseases, some of which attack the walls and some the valves. They may be acute or chronic in their course. Diseases may attack the heart primarily, or the affection of the heart may be secondary to diseases of other organs. Inflammation of the pericardium, or pericarditis, may follow wounds in the region, and as these wounds are often septic purulent inflammation of a serious type may ensue. Effusions of blood, and such conditions as hydropneumopericardium (collection of fluid and gas within the pericardial sac), may occur as complications of fractures of the bones of the thorax. A blow may set up a grave lesion of the heart or its envelopes, and this without there being evidence of it on the soft parts or bones of the thorax (Becker, Ollive and Le Meignen). Thiem (Sand) records a case of pericarditis after a contusion in which there were no external signs; death five days after, diagnosis confirmed by autopsy.

Effort (strain) is a cause of pericarditis, Lehman (Sand).

Pericarditis (inflammation of the pericardium) is most often caused by rheumatic and other fevers, and by extension of inflammation from adjacent parts, as in pleurisy, &c. The disease may become arrested in its dry stage, or it may go on to effusion of fluid, which may, if large, cause death; if small in amount it will take from a few days to several weeks to become absorbed. The fluid may become purulent, in which case the prognosis is unfavourable.

Tuberculous Pericarditis is usually an accompaniment of tuberculous disease elsewhere, generally tuberculous pleurisy. It may be a traumatic metastasis from a deposit in the lung (Ercklentz), or from a tuberculous bronchial gland (Reichel, Sand).

Pericarditis usually appears rapidly after injury: six hours after in some cases, in others fifteen days or three weeks (Ollive and Le Meignen). The disease may clear up and full recovery take place, or it may cause adhesions to the walls of the heart, in which case the movements of this organ may be very seriously interfered with. A form of chronic pericarditis, without there being any acute stage, may ensue after injury. This produces pain in the precordial region, and is followed by the formation of adhesions more or less extensive, and by neuralgic troubles, &c. (Thoinot, Ollive and Le Meignen). Rupture of the pericardium may occur without rupture of the heart, (Fischer, Thoinot).

Myocarditis.—Inflammation of the muscular wall of the heart. It may be acute or chronic. The acute is usually caused by or follows blood-poisoning, diphtheria, typhoid, rheumatic fever, endocarditis, pericarditis.

Chronic Myocarditis may follow acute myocarditis, or disease of the coronary arteries (the arteries which supply blood to the heart-muscle itself), or be associated with arterio-sclerosis and the disorders which initiate it. Traumatism as a possible cause is admitted by Hockhaus (Ollive and Le Meignen). This includes a blow on the precordium, a fall on the back, a violent concussion. R. Stern (quoted by Thoinot) records the case of a man of nineteen years, with previous good health, who received a violent contusion of the thorax without external wound. Pleurisy and traumatic pneumonia followed. Later there was established a permanent acceleration of the pulse, cyanosis without dilatation of the heart or murmurs; work became impossible, for the least effort brought on a sensation of stifling. Eleven months after the accident there was dilatation of the heart, but no murmur; the pulse was very small and feeble. The condition gradually got worse, and at the end of three years there was total permanent incapacity. At this period the symptoms were moderate cyanosis (blueness), dyspnœa (difficult breathing), small irregular pulse, increase of cardiac dulness, and a tricuspid murmur.

Thoinot observes that in this case the diagnosis of chronic myocarditis is as certain as possible, and that the traumatic cause is probable,

Aneurism of the Heart may follow chronic myocarditis or endocarditis, or a wound of the hear. If an i njury sets up a myocarditis, and the wall yields to the intracardiac pressure, an aneurism will ensue.

Rupture of the Heart may follow a blow, a fall, or a compression injury to the chest, a violent effort; but patients have been found dead in bed with rupture of the heart-muscle under circumstances where effort did not appear to play any part (Shaw). Death usually follows immediately, but may be delayed for days (nine days, Ebbinghaus, Sand).

The Valves of the Heart.—Injury and strain may cause rupture of the valves of the heart. This accident has occurred in healthy valves (Oliver), and in valves altered by disease. Thoinot gives a considerable number of references to this condition, many of them verified by autopsy. He cites the thesis of Dreyfus, 1896, enumerating the cases published previous to that date. These are: ruptures of the aortic valves, forty-six; of the mitral, twenty-two; of the tricuspid, three; of the pulmonary, one. The causes noted are blows on the chest by the pole of a coach, &c., compression between wagons, kicks, falls from a height, great efforts, strains.

Some of the recorded cases leave room for doubt as to their direct traumatic origin, but there is sufficient experimental, clinical and pathological evidence to make it certain that trauma and effort can be admitted as a cause of rupture. The symptoms are sudden intense pain, breathlessness, fainting, sometimes hæmoptysis, epistaxis (nose bleeding). There is usually permanent and complete incapacity for work. Occasionally, however, as in the patient of de Quervain (Ollive and Le Meignen), work may be continued for the day. An examination will reveal murmurs over the valves. In chronic progressive disease of the valves of the heart, the organ gets time to accustom itself to the leaky condition; but in sudden rupture of aortic or mitral or other valves the heart has the greatest difficulty in becoming compensated. Sudden death at the time of the accident is common, and patients rarely live for two years. In the *Lancet* of July 18th, 1908, there is a record of a case of traumatic insufficiency of the mitral valve, caused in a mason of 48 by trying to stop the slipping of a heavy stone. He felt pain and a tearing sensation, with immediate difficulty in breathing; he was unable to work, and went home; was admitted to hospital three and a half months after with a mitral murmur and œdema of the limbs. Death occurred in less than a month. A necropsy showed a dilated heart with hypertrophy of left ventricle, mitral valve sound, and there was a torn and retracted posterior pillar, the upper fragment floated, suspended by chordæ tendineæ; the evidence of a tear in the wall, a large granular hæmorrhagic patch. Ollive and Le Meignen consider as curiosities the cases of Barie, Duroziez and Alvarenga, where the subjects lived ten, eleven and fourteen years after the accident. They also relate the case cited by Castiaux and Laugier, in which a patient injured in a railway accident, twenty-one years after showed no trace of the aortic disease for which he had received compensation. If the signs and symptoms of valvular disease set in several days after the injury, it is probable that the rupture of the valve was incomplete at first, and increased later ; if the valvular disease appears after an interval of several months subsequent to the occurrence of a severe injury affecting the heart, it is probable that a chronic myocarditis or endocarditis has developed as a consequence of the injury, causing valvular incompetence.

Acute Dilatation of the Heart may occur from an abrupt and intense increase of pressure, as in a violent strain or effort. This is more liable to occur in a diseased or weakened heart : death may ensue immediately, or take place later. In the patient of Jorns (Ollive and Le Meignen) this occurred thirteen days after a strain. Dilatation of the heart may follow prolonged fatiguing work ; the dilatation may be rapid, with lowered blood pressure ; small, weak, irregular pulse, and venous congestion.

Violent Emotion.—Fright can produce serious effects on a person suffering from disease of the heart. In regard to this Thoinot relates the case of an elderly lady who had long suffered from valvular disease, which permitted a tolerable existence. Her room was entered by masked robbers, who attacked her. The direct traumatisms inflicted were slight, but the fright was considerable. There ensued imperfect systolic contractions of the heart (asystolism), and death about a fortnight later.

Aggravation of Valvular Lesions by Traumatism.—In cases of old standing valvular disease of the heart, nature makes continuous efforts to meet the strain made on the organ as a result of the leaky condition of its valves by increasing the strength of the cardiac muscle. This hypertrophy is sometimes so effective and so good that it compensates for the leaks, and the subject is practically well, and may be quite unaware of his heart lesion.

If an illness or an injury occurs which causes the heart-muscle to fail, abruptly or slowly, then the compensation is said to be broken, and all the severe and distressing symptoms of heart disease develop more or less rapidly. It is clear that if injury, emotion, &c., can cause such conditions as pericarditis, myocarditis, endocarditis, rupture of valves, aneurism, &c., in a healthy heart, they are much more certain to produce serious effects on a diseased heart. Even if traumatism, &c., does not produce direct damage to such a heart, it may destroy the compensation hypertrophy, and render apparent a disorder which might have remained latent for years. It is not necessary that the trauma should take effect in the region of the heart to cause this failure of compensation. This may follow severe injuries to any part of the body. Merklen puts this matter shortly and lucidly when he says, "There was a lesion, there is now a disease" (*Semaine Medicale*, 1899, p. 241; Shaw, *B. M. J.*, April 10th, 1909.) (*See* **Endocarditis.**)

Traumatic Neuroses of the Heart.—These are frequently found to follow injuries to the upper portion of the body. Like the neuroses in general, their pathology is ill understood; they are classed at present amongst the functional disorders. A neurosis is commonly defined as a nervous affection, devoid of anatomical changes; but it is impossible to conceive a disease without some underlying physical basis. The lesion may not be visible microscopically, it may be molecular or biochemical, but it is none the less real. In functional diseases the underlying physical changes are slight in degree, and they are not irreparable — unlike diseases due to gross anatomical lesions, which always leave behind them some trace of the old trouble (Purves Stewart).

This, which applies to all neuroses in general, is specially true in regard to traumatic cardiac neuroses.

Palpitation is a rapid and tumultuous beating of the heart, of which the patient is fully conscious and also apprehensive. It is noticed after injuries, violent emotions, &c. Palpitation may also be provoked by drugs, by tobacco, coffee, &c., and is an accompaniment of serious disease or damage.

Tachycardia.—Rapidity of the pulse (the normal being seventy to seventy-five per minute). This may be associated with demonstrable disease of a local or constitutional nature. It is frequently present in neurasthenic conditions, and there is a recognised **paroxysmal tachycardia,** which may last for an hour or more, and recur at intervals. It may be attended by anxiety, nausea and precordial distress, and the pulse rate may rise to 200 or more.

Bradycardia.—Abnormally slow pulse. It may slow down to forty per minute, and in rare instances to four. This condition occurs after fevers, chronic digestive disorders, diseases of the heart and brain. There is a form of the condition, **Essential Bradycardia,** in which no lesions can be found *post-mortem*. Bradycardia, which is permanent or temporary, may be one of the traumatic neuroses.

Arrhythmia is an intermittent or irregular pulse.

Intermittent means the omission of one or more beats, and an **irregular** pulse is one in which the beats occur at irregular intervals. There are several varieties of arrhythmia. The **Pulsus Alternans,** in which a strong alternates with a weak beat ; the **Pulsus Bigeminus,** in which the beats occur by twos, and the **Pulsus Trigeminus,** in which they occur by threes ; **Pulsus Paradoxus,** in which the pulse becomes almost or quite imperceptible during inspiration.

These conditions may be independent of detectable cardiac disease ; they may also be found associated with disease of the heart or brain, circulation of poisons in the blood, such as alcohol, digitalis, tobacco, aconite, coffee, tea, the toxins of fevers, traumatic or ordinary neurasthenia, digestive troubles, Graves' or Bright's disease.

The bigeminal and trigeminal pulses are found in disease of the mitral valve and after the use of digitalis. The paradoxic pulse may indicate adhesions, effusions or growths in the pericardium, obstruction to air entering the lungs, or simply a weak heart.

HEAT STROKE. HEAT EXHAUSTION.—Caused by sufficiently prolonged exposure of the body to a temperature above 40° C. (104° F.) (Moussoir, Ollive and Le Meignen). Sambron thinks the condition an infectious disease.

Insolation (Sunstroke) is caused by the action of the sun on the head. It is not necessary that the exposure should be very prolonged. Ollive and Le Meignen also think that it is not necessary to have so high a temperature (104° F.) as mentioned by Moussoir, that insolation can occur in damp and heavy weather with the thermometer at 25°—30° C. (77°—86° F.). The symptoms may develop when the patient is at rest, several hours after the exposure; they may be quite benign, or grave complications and sequelæ may follow.

Pneumonia, paralysis, mental troubles, neurasthenia, diseases of the central nervous system, death may follow sunstroke; serious intestinal hæmorrhage may follow heat stroke. **Heat exhaustion** comes on somewhat slowly, sunstroke suddenly. The temperature of the body is never very high in heat exhaustion (102° F.); in sunstroke it is high. In heat exhaustion the coma is not profound; in sunstroke it is profound. The abuse of alcohol is a predisposing element in some of the cases. Insolation and heat strokes are all the more serious if the patient is the subject of heart or kidney lesions, disease of the lungs, pleura, &c.

The **Coup de Froid** of French writers occurs quickly in a person who leaves a hot place and goes into a very much lower temperature. In these cases also the amount of drink taken and the existence of pre-existing disease will be of great importance. **Frost bite** may occur. Sudden changes of temperature from heat to cold, causing rapid cooling, may provoke an attack of pneumonia.

HERNIA (Rupture).—The protrusion of a loop or knuckle of gut or other structure through an abnormal opening. There are a good many kinds of hernia, and there are varieties of each kind. The causes of hernia may be divided into **predisposing** and **exciting.**

The predisposing causes include **Heredity:** there appears to be a strong probability that there may be an inheritance of anatomical defects, and so an undoubted predisposition. **Age:** hernia occurs at all ages, but a considerable proportion develop during infancy, due largely to congenital defects. The great proportion occur during the period of greatest physical activity. **Sex:** on account of the greater muscular activity of males they are more prone to the condition. We may also include **Elongation of the Mesentery** and displacement and **Prolapse of the Abdominal Organs,** as well as **Weakness of the Abdominal Wall.**

The question of congenital defects has received much attention in relation to hernia. Some surgeons contend vigorously that every hernia of the gut passes into a preformed sac—that is to say into a sac or pouch of the peritoneum, not formed by pressure of the abdominal contents, but in some other manner, the precise nature of which is not as yet fully known. They reject the view that a hernia can ever be acquired. This application of the saccular theory to all hernias is not accepted by the majority of surgeons, who consider that the evidence in support of it is weak and unsatisfactory.

Among the **exciting causes** are sudden effort, strain. A laborious occupation may, by reason of its requiring severe and sudden muscular effort, thereby producing sudden increase in the intra-abdominal tension, cause the immediate occurrence of a hernia. That such a development may take place, and that rupture of the walls of the canal in the most common form of hernia, the inguinal, does occur, has been repeatedly verified by operation and by necropsy. Effort, strain, &c., may act in another way than in suddenly producing a hernia. Frequently repeated strains may produce muscular weakness, and consequently less ability to resist even slight increase in the intra-abdominal pressure. A moment arrives during which this increased pressure acts, the result being that the gut comes by the way of least resistance. This event may be coincident with straining at stool, coughing, sneezing, vomiting, &c., and also with effort or strain at work; these latter, while they may be the actual determining cause of the appearance of the hernia, may also be themselves the frequently-repeated strains which produce the necessary muscular debility and yielding of the parts, and thus gradually prepare for the final effort which renders the hernia apparent.

A less effort in the first case, and a shorter period in the second case, will be required to develop the hernia if there is the congenital defect known as a **patent** or only **partially obliterated funicular or vaginal process.** This is a tubular canal, which connects the peritoneal cavity with the covering of the testicle. It is the tube through which, in the process of development, the testicle descends from the abdomen to its final resting place in the scrotum. It ought to become obliterated shortly after birth, but it is frequently open or only partially closed; consequently, such a developmental irregularity may have an important bearing on some of the forms of hernia.

The **Inguinal Canal,** which contains the spermatic cord (and possibly an unobliterated vaginal process) in the male, and the round ligament of the uterus in the female, constitutes a weak portion of the abdominal wall. It is about one and a half to two inches in length; its inlet or commencement is called the internal abdominal ring, its outlet the external abdominal ring. It passes between the layers of the muscles of the abdomen. Any congenital or acquired weakness, or any combination of these, will contribute to the development of an inguinal hernia.

The hernia may appear suddenly as a result of effort, strain, injury, &c. The gut may be forced abruptly into a preformed sac or canal, or it may be forced through the inguinal canal or rings, causing dilatation or rupture of these. This will usually, but not invariably, cause a sharp pain, and possibly vomiting or fainting. The degree of pain will most likely depend on the amount of gut and the size of the opening. This sudden traumatic hernia may be as large as a lemon (Sand). It may also be bilateral (Bauwens, Sand). The more slowly growing hernia—that is, the one caused by repeated traumatisms weakening the abdominal wall, as in workmen who are required to undertake heavy strains at intervals—might almost be described as a disease of occupation.

Cases are frequently noted in which a hernia is found to have passed the internal abdominal ring and entered the upper portion of the inguinal canal without the patient being in the least aware of it. In such a case an effort could easily bring the gut down the canal, and even out of the external abdominal ring: the feeling of its descent, as of something giving way, might be the first indication to the patient of his being the subject of a rupture. The sudden traumatic hernia, and the slowly developing form just mentioned, may be classed as the acquired or virile inguinal hernia. The **Congenital Inguinal Hernia** depends on the failure of the vaginal process before mentioned to become obliterated. It must not be taken because it is called congenital that the hernia exists at birth; the predisposition is there, but the hernia may not appear for months or years.

There are other varieties of **Congenital Inguinal Hernia,** one in which the vaginal process is partially obliterated, usually at the internal ring, by a slight partition. A hernia develops and pushes the peritoneum against the partition, which stretches and comes down the open part of the vaginal process, and the result is a formed or acquired sac inside a preformed or congenital sac; or again, the acquired sac may come down independently of the patent process, but immediately behind it. This is the so-called **Infantile Inguinal Hernia**; in reality it is a congenital hernia. It is impossible to distinguish clinically these different kinds of hernia in adult life, nor can they always be distinguished at operation.

A question frequently arises as to how long a hernia has existed, whether in a given case the rupture is of recent origin or of long standing. The indications which favour the view that a hernia is recent are a history of pain at the moment of its occurrence, and coincidental with a recent effort or injury calling attention to the part, and the necessity for treatment. The size would usually be small, rarely larger than a lemon; there may be also some ecchymosis if the muscular fibres are much torn. The bulging may be distinct at once, or it may not show for several days (Duchamp Loriot, Ollive and Le Meignen).

At the operation for the cure of hernia sufficient evidence will not always be obtained to make one able positively to affirm that the hernia is recent; but a thin sac without firm adhesions will plead in favour of recent origin, as will also the fact that there has not been any hernia before the effort or injury. To accept this latter at its full value it is necessary that the medical man who makes such a statement should have had a not too remote opportunity of making an examination of the patient.

An old inguinal hernia is usually large, and if no truss is worn it will readily come down into the scrotum; there will frequently be pressure-marks or abrasions, produced by the truss or bandage. If it is a reducible hernia, when reduced it readily recurs on the patient standing up. In an old oblique inguinal hernia which has been down many times, the inguinal canal is wide and easily dilatable; it is directed straight into the abdominal cavity instead of being oblique. At the operation the sac of an old hernia is usually found to be thick, and will frequently have adhesions of omentum in it.

The **Direct Inguinal Hernia** is an acquired hernia. It is globular in shape, and rarely descends into the scrotum ; it is more in the nature of a ventral hernia, as it does not come through the inguinal canal, but may be forced through or past the edge of the conjoined tendon of the oblique and transversalis muscles, about the level of the external ring of the canal, or even through the external ring, thus making it difficult at times to distinguish a direct from an oblique hernia.

A hernia is said to be complete when it has entered and distended the scrotum in the male and labium in the female. It is called a **Bubonocele** when it has just appeared outside the external ring.

An **Interstitial** hernia is one which occupies the canal. It may be subcutaneous, subaponeurotic (Eccles).

A **Pro-peritoneal** hernia is one which lies between the peritoneum and the transversalis fascia, and is the third interstitial variety of Eccles.

Femoral or Crural Hernia.—A hernia into the crural ring. This ring is an unyielding opening, bounded behind by bone, in front by Poupart's ligament, externally by the femoral vein, internally by the sharp knife-like edge of Gimbernat's ligament. This hernia is often acquired ; it is never congenital, and rarely occurs before puberty. There may be a weakness of the parts, or possibly a peritoneal diverticulum, which may predispose to the development of this hernia. Females are more prone to it than males.

Umbilical Hernia.—Usually classified as congenital, infantile, acquired. It is common in infancy, and may be due to congenital causes, such as failure of the abdominal wall to close at the navel, and so prevent the egress of the abdominal viscera, or it may be due to yielding in infancy of the navel scar. This weakness may persist into adult life, and so predispose to hernia. Sudden effort or repeated strains may increase it. It occurs mostly in females. Pregnancy has an important influence on the development of this form of hernia.

Ventral Hernia is a protrusion of abdominal contents through the belly wall. It occurs after pathological conditions and traumatisms which weaken the wall, such as rupture of abdominal muscles, wounds, abscesses, properitoneal fatty tumours. These hernias are often very large, and difficult to retain with a belt or truss. Operative treatment may be necessary.

Epigastric Hernia is a hernia through the median white line (linea alba) of the abdomen. A violent blow may rupture the aponeurosis (the strong investing membrane of the muscles), and so permit the exit of a portion of stomach, gut, &c. The most common cause is the growth of a fatty tumour through the white line, dragging the peritoneum with it, and so forming a sac for viscera to fill up under strain, effort, &c. Pads may support; operative treatment is often successful.

Diaphragmatic Hernia usually follows severe injuries to the chest and abdomen. (*See* **Diaphragm.**)

Obturator Hernia is a protrusion through the obturator canal. This hernia is in the nature of a concealed hernia, the canal being deeply situated and covered by the muscles of the inner side of the thigh, and just under the horizontal ramus of the pubes. It may develop from even slight effort, and frequently gives evidence of its occurrence by the symptoms of strangulation. It is commoner in females than in males. It may follow effort, strain, &c. Owing to its depth, pads, &c., are hard to adapt properly. Operation may be successful.

Lumbar Hernia.—This is a rare variety, and is situated behind and between the last rib and the crest of the ilium (haunch bone). It may be due to congenital weakness of the parts, and be bilateral; it may follow operations in the region, abscess, injuries, violent blows, &c. The protrusion may either come through the triangle of Petit, or more likely through Braun's space (Lesshaft's triangle). Both these are weak spots in the muscular wall, the latter especially so, as it may transmit the twelfth intercostal nerve or subcostal vessels and nerves, these being a guide for the exit of the hernia. It may be retained by supporting pads or trusses, and cured by operation.

Sciatic Hernia is a very rare condition. The protrusion makes its appearance on the back of the hip. It may come through the greater or lesser sciatic foramen. Strangulation is said to occur in 35 per cent. of the cases. Injury, falls, effort, are noted as causes. Straps and belts may support it, cure is difficult.

Perineal Hernia.—Protrusions which make their way through the pelvic floor to the skin over the space between the anus and the genitals. The condition is extremely rare. The hernia may pass between bladder and rectum in the male, and appear as a round tumour in the perineum ; in females between uterus and rectum, and appear near the anus or posterior part of the labia. It may pass downwards, forcing the rectum or vagina outwards, thus making a hernial prolapse. If it passes between uterus and bladder it will cause a prolapse of the anterior vaginal wall. The most important predisposing cause is congenital deepening of the pelvic floor at the pouch of Douglas ; the exciting cause may be falls from a height, forcing the peritoneum into the space between the coccygeus and levator ani muscles, or thrusting the gut into a congenital diverticulum. Strangulation may occur, and operation by the abdominal route be required. This hernia is not easy to support, and is difficult to cure.

Retro-peritoneal Hernia is the prolapse of a portion of gut into the foramen of Winslow or into the various peritoneal fossæ. The condition is predisposed to by congenital defects, and is a very dangerous one; fortunately it is rare. For a full account see the works of Jonnesco (1890) and Moynihan (1899).

A hernia may be reducible, irreducible, incarcerated or obstructed, strangulated. By **reducible** is meant one that can be returned by manipulation. By **irreducible,** a hernia in which the contents of the sac cannot be returned without operation. The contents remain in the opening, which does not grasp them tight enough to produce strangulation, though the latter may come on at any time if more abdominal contents come down, or if the hernia becomes inflamed through injury or extension of inflammatory disease. A hernia is said to be **incarcerated** or **obstructed** when its lumen is obstructed from within. This is common in irreducible herniæ, and occurs from hard fæces, gas, foreign bodies, undigested food. A hernia may become **inflamed** from injury, extension of inflammation, strangulation.

Strangulation is the condition in which the lumen of the gut is so obstructed as to prevent the passage of fæces, gas, &c., and in addition the gut is so constricted that its blood supply is interfered with. The symptoms of strangulation, when established, are pain, vomiting, obstruction ; these may set in suddenly and early, or they may be gradual and delayed. **Strangulation** may be complete at once if the gut is forced through an opening with sharp or unyielding edges ; in such a case, where the constriction is tight, the symptoms will show themselves early. If the contents of the sac consist of omentum, or if only a portion of the lumen of the gut is caught (Richter's hernia), or a diverticulum is nipped (Littre's hernia), or some other organ, such as the appendix, is strangulated, then the signs and symptoms may be delayed, and when they develop may be incomplete. If the strangulation is not relieved gangrene may follow. The length of time that it takes for this to happen will depend on the degree of pressure exercised by the constriction. Death must follow if the strangulation is unrelieved. The treatment of hernia by operation, the so-called **radical cure,** has been much improved in technique, and is so safe that it is very largely practised.

The mortality of the operation in skilled hands is stated to be about 0.5 per cent. ; it is probably much less than this. The recurrences are considerably under 5 per cent. (Jacobson).

The operation for strangulated hernia has a much greater mortality, as it is usually undertaken under circumstances of urgency and danger. The figures given by Carwardine are from 2 to 60 per cent., varying according to the time which elapses between the strangulation and the operation. Sometimes the surgeon is able to carry out at the same time an effort at radical cure.

The value of a truss, as enabling a workman to continue his occupation without resort to operative treatment, will depend on the size of the hernia or the nature of the occupation, or both combined. Many workmen carry on laborious work with a well-fitting truss ; an ill-fitting truss is worse than useless. If the hernia is small, and the work such as does not involve heavy lifting or straining, or the displacement of the truss, then a workman may be hardly at all incapacitated. On the other hand, a workman with a hernia must always be in some danger of strangulation, and any neglect, carelessness or forgetfulness in the management of the truss will materially increase this danger. That the truss is not always effective is well established by the fact that there are a large number of operations devised with the greatest ingenuity, with the object of doing what it fails to do, namely to retain the hernia, and to be a security against strangulation. Some surgeons advise the wearing of a truss for a time after the radical operation as a precautionary measure. I think that in many cases this is a wise procedure, and I believe that for three months after a workman has been operated on he should not do any but the very easiest work, and that for a total period of six months he should not do any very heavy work.

HIP JOINT.—The articulation of the head of the femur and the innominate (haunch bone). (*See* **Femur.**)

Injuries to the hip may set up an inflammation in the joint. This may be a simple inflammation and become resolved, and full use of the joint return, or atrophy or anchylosis may follow. The joint may suppurate and become disorganised, inflammation of the bone (osteitis) may also ensue. (*See* **Bone.**)

Arthritis deformans and tuberculous arthritis may be started by injury. (*See* **Arthritis.**) Inflammatory disease, set up in the joints by traumatism, may have as a sequence dislocations which are known as pathological dislocations.

Coxa Vara is a condition in which there is a diminution of the angle at which the neck of the femur is set on the shaft. It is mostly due to rickets in childhood, but it may follow fractures and injuries of the neck of the femur.

Coxa Valga is the reverse of Coxa Vara : in it the angle, instead of being diminished, is increased. It may follow fractures, rickets, paralysis, osteitis, &c. Both these conditions may cause disability in the use of the lower limb.

Wrenches and strains of the joint, if not associated with fractures or rupture of muscles, &c., usually get well in about six weeks.

Hip Joint Disease is a tuberculous inflammation, which frequently ends in complete destruction of the joint. It is quite possible for an injury to be the starting point of a tuberculous arthritis. The disease occurs mostly in young persons, but it is found occasionally in adults. (*See* **Joint.**)

HODGKIN'S DISEASE (Pseudo Leucæmia). — A disease in which the glands of the neck become enlarged first, and later all the lymphatic glands of the body. The spleen increases in size, but there are no changes in the blood in the earlier stages ; later there is severe anæmia. The glands may occasionally suppurate, pneumonia may develop, leucocytosis (increase of the white corpuscles of the blood) may occur if there is any complication, and is regarded as an accidental concomitant. The disease lasts from a few months to a few years; recovery is rare. Sand notes an observation of traumatic pseudo leucæmia. (Borntraeger, *Aerztl. Sachverst Zeit.*, 1901, 15.)

HOSPITAL.—The value of hospital treatment for the more serious and urgent cases of injury and disease amongst workmen is fully appreciated, and every advantage is taken of the provision of modern medical and surgical science for the restoration of the industrial wounded to their homes and duties. But there is a considerable class of cases crowding the out-patient departments of hospitals and surgeries of works' doctors which would benefit enormously by being treated in a hospital; such cases as eczema of the limbs, ulcers (varicose and other), and many such like conditions which have originated or have been aggravated by injury. These are just the people who have difficulty in getting into hospitals, as they are displaced by those who are more desperately in need of admission. They can rarely have in their own homes the necessary skilled nursing, and so the duration of incapacity for work, instead of being short, is prolonged unduly. With this is generally associated a diminished income, and consequent insufficient or unsuitable food, thus physical depreciation and ill-health are perpetuated.

If arrangements could be made by insurance companies or workers' unions, or by both in co-operation, whereby some of these cases could be admitted into nursing homes or sanatoria under medical supervision, much good would be accomplished, and workers restored to their occupations at an earlier date. This matter is no doubt primarily one of finance, and the questions which usually arise are (1st) What will it cost? (2nd) Who is to bear the cost? As regards the first, there must surely be homes where a fee of two guineas a week ought to be profitable, and such a charge, if borne by the different bodies interested, would scarcely be a too distressing monetary weight.

On the second point it is naturally in the interests of the insurance company and the employer, as well as in that of the workman, that the latter should be speedily restored to health and able to follow his usual occupation ; so that if good and rapid results followed, the financial burden, even if borne by the employer in the first instance, might very well actuate finally in his favour. The workman undoubtedly suffers, for it is his capital, physical health, which is being depreciated, and he is a drain on the funds of his society ; he might, therefore, through his union, consider what contribution he is called upon to make. Possibly some of the well-equipped and staffed Poor-Law infirmaries might become available for such work. The slur of pauperism would hardly be applied if payments could be made.

The worker who suffers most in these cases of comparatively slight, but often totally incapacitating, injuries is the one who is without the compassionate protection of a friendly society or trades union. For these the comfort and attention of the Poor-Law infirmary ought to be made accessible without any risk of the brand of pauperism being inflicted. Another use to which a hospital or nursing home might be put rather more frequently than it is at present is that of observing the illness or injury which presents certain features closely allied to simulation or malingering. In many such cases the problem can be solved by continuous, careful observation in an institution, the rogue can be unmasked, and the honest sufferer saved the additional pain of hasty and unmerited imputations of imposture.

HOUSEMAIDS' KNEE.—This is an inflammation of the pre-patellar bursa (q.v.), due to kneeling. It is common among domestic servants, and if it becomes infected through an abrasion of the skin it will closely resemble the Beat Knee of miners (q.v.). The Departmental Committee did not consider that it should be scheduled, though an occupational disease, because the duration is rarely over a month, and an employer is obliged before discharging a servant to give either a month's notice or to pay a month's wages in lieu of notice, and, in addition, the disease is avoidable by the use of a proper mat.

HUMERUS.—The bone of the upper arm which extends from the shoulder to the elbow. The upper end is rounded into a **head,** which fits into the glenoid cavity of the scapula (shoulder blade). Immediately outside this smooth, rounded surface is a faint groove, the **anatomical neck ;** still further out are the **tuberosities.** Just below these, and above the insertion of the pectoralis major, latissimus dorsi and teres major, is the somewhat constricted portion of the shaft known as the **surgical neck.** On the posterior surface of the shaft, commencing from above and internally curving downwards and outwards, and ending about an inch below the centre of the bone, is a shallow groove, which is traversed by the **musculo spiral nerve** (q.v.). The lower end forms with the upper ends of the radius and ulna the elbow joint.

Contusions and Wrenches of the shoulder may start in some subjects a condition of arthritis which is incapacitating and difficult to cure. Simple wrenches usually get well in about two months. Fractures which occur after injuries to the shoulder are **fractures of the anatomical neck, separation of the upper epiphysis** (q.v.) (occurs between sixth and twentieth year), **fracture of the surgical neck.** In any one of these there may also be associated as a complication dislocation of the humerus, fracture between the axillary and deltoid muscles, fracture below the insertion of the deltoid. Fractures at the lower articular end may involve the elbow joint and also the ulnar nerve. The external condyle may be fractured ; there may also be a transverse fracture and a vertical one as well, constituting the T-shaped fracture. Separation of the lower epiphysis occurs before the seventeenth year.

Fracture of the humerus may occur by severe muscular effort; it usually takes place about the middle of the shaft. Fracture of the anatomical neck may occur from slight trauma; the pain is particularly persistent in this injury, and recovery is tedious. Separated upper epiphysis may unite readily if there is reduction without much displacement; if unreduced, deformity and disability will ensue. In fracture of the surgical neck there may be great difficulty in reducing and retaining the fragments; even with good apposition there frequently results shortening of the arm and impairment of movement, such as abduction and external rotation.

Fracture of the surgical or anatomical neck, or separation of the upper epiphysis, complicated with dislocation of the head of the bone, is not unusual; it is a very serious condition, and it is sometimes impossible to reduce it. Operative treatment may be tried after all evidence of contusion has disappeared. The results are frequently good, but not always so.

In fracture of the shaft, if good apposition of the broken bone can be secured, union will take place in from four to six weeks. Non-union frequently occurs, and abnormal mobility after an interval of three months will be classed as non-union; before this time it may be only delayed union. Often very considerable atrophy of muscles follows fractures of the humerus. The musculo spiral nerve (q.v.) may be involved, particularly if the fracture is at the middle or lower third of the bone; it may be injured at the time of the accident, or it may become grasped and destroyed later, either by the callus or by cicatricial tissue. Paralysis may follow, and is evidenced by inability to extend the fingers and loss of supination; there may be also loss of, or impaired sensation in the lower half of the outer and anterior aspect of the arm, and in the middle of the forearm as far as the wrist. (*See* **Dropped Wrist.**)

Dislocations of the head of the humerus may take place in various directions—anterior, downward, posterior. If simple, and reduced early, they get well in from four to eight weeks. Fractures and dislocations are liable to be complicated by injuries to the soft parts, and also vessels and nerves. (*See* **Circumflex Nerve.**)

In the case of dislocation the capsule of the joint may be relaxed and weakened, and recurrent dislocations be established, causing permanent unreliability of the shoulder. Injury to the vessels may necessitate amputation, and damage to nerves may be followed by permanent paralysis or intractable neuralgia. Anchylosis may follow injuries involving the shoulder joint; in this the incapacity is estimated at 50 to 60 per cent; atrophy of muscles, 25 to 58⅓ per cent.; chronic arthritis of the shoulder, 16⅔ to 66⅔ per cent. (Rohmer). (*See* **Elbow.**)

HYDROCELE.—A collection of fluid in the serous sac of the testicle. It may be acute or chronic. The acute form generally appears within four days of the injury, which is usually direct. It may also be associated with inflammatory disease of the testicle. Simple hydrocele by effort can hardly occur, but effusion of blood into the sac (hæmatocele, q.v.) under the influence of effort may occur. Chronic hydrocele may follow the acute form, though it is usually found quite apart from injury. It may grow large and by its weight cause pain and dragging sensations in the scrotum. It is not ordinarily a serious disorder; it may be temporarily relieved by tapping, and permanently cured by operation.

HYDROCEPHALUS.—A fluid effusion within the skull. The disease usually occurs in infants as a tuberculous affection, and is an acute or chronic internal meningitis. An external serous meningitis (inflammatory external hydrocephalus) of traumatic origin also occurs; this may be diffuse, and cause death by the pressure of the exudation, or it may be circumscribed and localised to a particular portion of the brain membranes (meninges). (*See* **Brain.**)

Injury to the head may be the exciting cause of a malignant or inflammatory tumour, and this, by causing pressure on venous or lymph channels, may result in the accumulation of fluid in the skull, the symptoms in both forms being at first those of meningitis, headache, fever, delirium, sometimes convulsions, and paralysis. Brasch (Sand) cites cases of acute traumatic hydrocephalus, "Der acute hydrocephalus" (*Vierteljahrssch f. geichtl Medic*, 1898, 36, xvi, 2, pp. 292–318). Nonne (Sand) quotes cases more chronic in their course. Ueber Falle vom Symptomen complex "Tumor cerebri" mit Ausgang in Heilung. Ueber letal verlaufene Falle von "Pseudotumor cerebri" mit sectionsbefund (*Deutsche Zeitschr f. Nervenheilk*, 1904, xxvii, 3–4, pp. 169–216).

HYPOGLOSSAL NERVE.—Twelfth cranial nerve. Is a nerve of motion, and supplies the muscles which move the tongue. Injury to it usually is due to punctured or bullet wounds, mostly associated with dangerous injuries to neighbouring parts, internal jugular and carotid artery. If involved alone on one side, the tongue, when protruded, deviates to the paralysed side. These ill-effects produce very little inconvenience, later they may become unnoticed (Purves Stewart, Sherren). The affected side of the tongue atrophies, and deep furrows are seen on it. Persistent paralysis, as a result of injury to this nerve, can sometimes be cured by an operation.

HYSTERIA (TRAUMATIC).—A disease characterised in its fully-developed form by convulsions, anæsthesias, paralyses and contractures. The symptoms, which may be temporary or permanent, are both psychical and physical. The pathology of the disease is unknown; whether it arises spontaneously or as a result of traumatism it should not be regarded as exaggeration or fraud. The symptoms are not assumed, but are involuntary and uncontrollable expressions of mental ill-health. Bailey points out that the false statements of hysterics are not necessarily wilful lies, but may originate honestly from hallucinations or loss of memory. A great deal of the trouble is impaired will power. Paget, in speaking of an hysterical paralysis, said: "The patient says 'I cannot.' It sounds like 'I will not.' It really is 'I cannot will.'"

The hysterical patient differs from the neurasthenic in that the symptoms of the latter are largely of the subjective order. The hysterical patient shows generally something definite, namely paralysis, contractures, anæsthesia, convulsions, &c. Among the many causes of the disease, trauma, shock, fright, occupy leading places. The mental symptoms show a rapid alternation between excitement and depression, melancholia, and a morbid desire for sympathy. The anæsthesia may be unilateral, and it may be disseminated, but it never follows the anatomical distribution of nerves. It is often seen in the area covered by gloves and stockings; it usually disappears during sleep; it often varies in its position from day to day; its mobility may frequently be demonstrated by the application of a large magnet and as magnets have no such effect on anæsthesia due to structural nervous disease, the mobility is purely the result of suggestion.

If there is hyperæsthesia (excessive sensibility) and pain it is often lasting, as in the hysterical joint affections. The slightest touch appears to cause agony, while deep pressure is well borne, particularly if the patient's attention is drawn to something else. Hysterical pain rarely interferes with sleep. Psychologically speaking, the pain is not genuine, but to the patient it is quite real. An examination of the eyes often reveals a characteristic concentric limitation of the visual field and abnormalities in the colour fields. There may be spasm of the eyelids, and also ptosis (drooping of the eyelids). Contractures (continuous contraction) of the muscles of the legs, arms and face, may occur and last a long time. The paralyses which occur are usually sudden, the face mostly is free. The voice is frequently lost (hysterical aphonia), the knee-jerks are not exaggerated, no true ankle clonus, the electrical reactions are normal, and there is very slight atrophy. The sphincters are not involved. During the convulsive seizures the patients are rarely injured; they may bite the lips slightly, but never the tongue, and they are usually conscious of what is going on round them. Hysterical fever has been recorded by recognised authorities. As a rule hysteria does not cause death, but Gilles de la Tourette quotes cases in which death is said to have ensued from the disease.

As a rule the patients recover, and in making a prognosis it is well to remember that the condition may be associated with organic disease on the one hand, and that simulation may be a point of importance on the other. There is often a very considerable admixture of neurasthenia and pure hysteria. Patients are generally able to return to their occupations, but in the mixed and obscure forms they frequently get steadily worse, and sometimes become demented, or develop other forms of mental disease. Bailey states that " cases have been reported as chronic lunatics which had previously been regarded as simulators."

The best hope of recovery in a severe case is found in the rest-cure in an institution equipped for the purpose, the object being to get the patient away from too sympathetic friends, and to isolate him under a healthy disciplinary régime. It is an expensive form of treatment, and requires at least three months segregation to enable it to be of value in the re-establishment of health. In the less severe cases of pure localised traumatic hysteria it is probably true that the recovery will be so much the more easy, so much the more perfect, according to the rapidity of the litigation settlement.

HYSTERO EPILEPSY.—A name which has been applied to the convulsions of hysteria but it is really inapplicable, as it ought to mean a combination of hysteria and epilepsy, and not an imitation of epilepsy by hysteria. There is a distinct difference between epileptic and hysterical fits. The epileptic fit is of short duration, often occurs at night, and is not always preceded by signs. The hysterical fit is of long duration, rarely occurs at night, and preliminary signs are constant. In epilepsy the tongue is bitten, and there is almost constantly an involuntary passage of urine. These latter symptoms do not occur in hysteria. The pupil reacts to light in the hysterical fit, but not in the epileptic. After the attack of epilepsy the patient is commonly in a state of stupor ; in hysteria there is immediate recovery after the attack. It is, of course, possible for an epileptic to be hysterical, or for an hysterical subject to become epileptic ; but in such cases the signs of epilepsy being probably the most dominant, that disease would have the greatest claim to be placed alone in the title rôle.

INSANITY (TRAUMATIC), Mental Degeneration (Traumatic).—Injuries to the head may be followed by various modifications in the normal intellectual and moral faculties, modifications which are similar to those produced by ordinary mental disease, either hereditary or acquired. The condition is not by any means common. Jacobson quotes Da Costa as stating that injury is the direct cause of insanity in only 2 per cent. of the cases. Sometimes the disease appears immediately after the injury, and may be a continuation of the insanity produced by shock. It may develop after an interval of from one to ten years, or even longer, the longer period being the more readily admissible if in the interval there are such symptoms as vertigo, headaches, epileptic attacks, alterations in character, &c.

If the injury to the head occurs in childhood there may be an arrest of development, imbecility, moral perversion. In the adult the symptoms exhibit alterations in the moral and intellectual qualities, irritability, quarrelsomeness, violence, alcoholism, perversions of instinct, uncontrollable impulses, raving. The probability of cure in an established case is very remote. (*See* **General Paralysis.**)

Other forms of mental disease may follow injury to the head, such as persecution insanity, in which the patient believes himself followed by enemies; melancholia in which he suffers from great depression of spirits and gloomy forebodings, fear of death, &c.

The symptoms of perverted mental function which follow head injuries may end in dementia, which is insanity, characterised by loss or impairment of intellectual functions, will and memory.

This may be in its beginning a cerebrasthenia or neurasthenia (q.v.), and consequently the real nature of the disease may not be recognised until it is fully developed. When an injury occurs to a workman between the ages of forty-five to sixty, in whom there exists distinct evidences of arterio sclerosis (q.v.), rapid progress in the disorder frequently ensues, and we find a precocious senile dementia, " a second childishness and mere oblivion, that last scene of all that ends this strange, eventful history."

Insanity from Shock.—This is believed to occur, and cases are recorded in which there has not been the slightest physical damage to the head, yet insanity has followed, the nervous shock being the only attributable cause. Such cases are said to be very few in number. In these a form of delirium follows intense mental shock; it is characterised by insomnia, unrest, some loss of consciousness, incoherent speech, hallucinations, illusions, delusions. Bailey considers that such symptoms and signs are closely allied to the insanity which follows direct injuries to the head. He thinks that both mental shock and direct head injury produce alteration in the cerebral blood-pressure and blood-supply. Some of the cases have ended fatally in a very few days; in others complete and permanent recovery has taken place. **Post operative insanity** is a condition which occurs as a complication after operations. There is frequently a pre-existing neuropathic tendency, and to this is added great mental strain, pain, grief, &c. The disease may follow slight operations just as readily as more severe ones. See Christian Simpson, *Journal Mental*

Science, January, 1897; Picque, *Chirurgie des Aliencs.*) (*See* **Brain. Head Injuries. Neurasthenia.**)

INVAGINATION. INTUSSUSCEPTION, Telescoping of the Gut. (*See* **Bowel.**).—As a disease it readily occurs in young children, and unless relieved by abdominal operation or some other method it is rapidly fatal. In adults it may occur after direct abdominal contusion, or be produced by a jump or an effort (Leichtenstein). The condition is almost always a descending one in contra distinction to those invaginations which occur *post mortem;* in these it is usually of the ascending type (Hektoen). The symptoms are those of intestinal obstruction, and the indications for an operation are generally imperative. The course of the affection is not always very acute. Douglas states that about 18 per cent. of cases are chronic, and in these the obstruction does not become complete, partial stoppage existing for months, which may at any time end in strangulation or total obstruction. Ultimate recovery has rarely followed without operation in this type. Sloughing and separation of from eleven and a quarter inches (O'Connor) to five feet (Peaslee) of intestine has been observed the gut being cast off per anum, in the latter case four months before death ; in the former the patient was alive twelve months later. (*See* **Obstruction. Volvulus.**).

ISCHÆMIA.—Local and temporary anæmia of a part. **Ischæmic Paralysis,** or Volkmann's Palsy, is a paralysis of muscles which may follow the application of a too firm bandage to a fracture or be caused by laceration or embolism of the vessels of the part occurring at the time of the injury.

It is essentially an anæmia followed by chronic inflammation of the muscle ; this degenerates into fibrous tissue in proportion to the severity of the case. The nerves may either show no changes at first or they may be found to be degenerated. The condition is most often found in children after fracture near the elbow. The characteristic features are rapid loss of power of the part, contracture and resistance to passive movements. It is a very difficult disease to cure; therefore in view of this it almost appears better for a fracture to be badly set or for there to be non-union than for ischæmic paralysis to be established by the necessary firmness of bandages required to retain a fracture in a good position. The palsy may also set in even after the most skilfully-applied bandages and splints. (See *Annals of Surgery*, April, 1906, A. H. Ferguson; *Annals of Surgery*, September, 1908, A. S. Taylor.)

ITCH.—Bakers': An eczematous condition of the hands in bakers due to irritation caused by yeast and dough. **Bricklayers':** A similar condition set up in bricklayers by the lime in handling and laying bricks. **Grocers':** Due probably to the action of the sugar mite. **Washerwomens':** An eczema or a psoriasis due to the action of irritant liquids on the hands and arms. (*See* **Eczematous Ulceration.**)

JAUNDICE. Icterus.—A yellowness of the eyes, skin, and urine due to the presence of bile pigments in the blood. It may follow injuries to the liver and gall-bladder, or arsenic or phosphorus poisoning, and it occurs as a complication of various diseases. It may also be a consequence of floating kidney (traumatic or idiopathic), by reason of dragging on the duodenum or compression of the common hepatic duct. Two forms of this condition are recognised as following trauma: **L'ictère emotif primitif,** which follows a fright or a violent emotion, may appear almost immediately after the occurrence, but generally some hours lapse before the yellowish tint is developed. **L'ictère emotif secondaire** makes its appearance some days after; intestinal troubles are also usually present in the interval. Debove and Potain explain this secondary form of jaundice by stating that there is a disturbance of the intestinal nerve plexus and that micro-organisms take advantage of this to invade the biliary tract. The primary form is believed to be produced by a spasm of the bile ducts due to some effect on the central nervous system. Peripheral irritation may excite this spasm. A **reflex form of jaundice** seems to follow acute pain in an abdominal organ and also some abdominal operations. (Ollive and Le Meignen, Sand.) The disease may take some time to disappear, the length of time depending on the underlying cause. The emotional form usually gets well rapidly. (*See* **Liver.**)

JAW.—Fractures of the Upper Jaw occur from direct injury. They may be external and involve the alveolus, with consequent loss of teeth. These fractures, if they occur alone, are not dangerous, but they may have serious complications, such as injuries to the internal maxillary artery and profuse hæmorrhage, **damage** to the **infra orbital nerve,** causing loss of sensation over the side of the nose, face, and lower eyelid, and sometimes intractable neuralgia. The pain may cause complete incapacity for work. **Fractures of the Lower Jaw** are not uncommon; they may give rise to considerable deformity, as it is sometimes difficult to maintain the broken fragments in approximation. Non-union and false joint may occasionally result. **Dislocations of the Lower Jaw** are usually readily reduced, but after a dislocation has once occurred there is a great liability to recurrence on slight injury, and a condition called habitual dislocation ensues. **Ulceration of the gums** may be associated with mercury poisoning, and necrosis may occur in employes in match factories from exposure to the fumes of phosphorus. A greyish-blue line is seen on the gums in cases of lead poisoning. (*See* **Lead. Mercury. Phosphorus.**)

Lockjaw may follow inflammatory conditions in the region of or in the joint of the lower jaw, and is a troublesome disorder to relieve. It is a popular name for Tetanus (q.v.), this latter being a totally different and very dangerous disease, having no relation to the simple spasm of the muscles of the jaw or anchylosis of the joint here referred to.

JOINT.—An articulation between bones which permits of movement between them. Joints are lined with a synovial membrane and contain cartilages and ligaments, the whole being surrounded by a capsule. **Contusions** may occur and result in the effusion of serous fluid or blood into the joint. These may take a long period for recovery, and are frequently followed by atrophy of muscles and prolonged weakness. Sometimes effusions of blood or fluid leave after absorption hard pieces of fibrin which may cause painful interference with the movements of the joint. If a number of attacks of effusion have succeeded each other rapidly, the fibrin left may become organised into fibrous tissue, and there may result diminished mobility or even anchylosis.

In **Sprains** the ligaments may be wrenched or torn or unduly stretched, and pieces of bone or cartilage may be chipped off or the cartilages may be partially or wholly displaced. In many of these so-called sprains a fracture will be found on radiographing the part. A chronic inflammation of the tendons and their sheaths which usually pass over or near a joint may be set up by a sprain and be followed by contractures.

Laxity of a Joint, Flail Joint.—This may follow contusions, sprains, dislocations, fractures, distension of the joint with fluid or blood, muscular atrophy. The joint becomes unstable, as it is not well supported by the overstretched ligaments, and recurrences of effusion take place on a slight trauma. The abnormal mobility can be demonstrated by a careful examination of the limb. The knee-joint is most frequently affected, causing a weak and unreliable limb. (*See* **Knee.**)

Inflammations of the Joints. Arthritis. Synovitis (q.v.), are frequent after injury. Dislocations and fractures are common. (*See* **various joints: Ankle. Elbow. Shoulder.**

&c.). In certain diseases of the spinal cord (Locomotor Ataxia, Syringomyelia) the joints become enlarged (**Charcot's Joint Arthropathy**). This may take place from slight trauma. The patient may be in the very early stage of the spinal disorder, and be quite unaware of his disease. This is a disabling condition in itself, apart from the spinal lesion, which is its real origin.

Loose Bodies in joints are usually pieces of cartilage, organised clot or fibrin, bone, &c. These are commonly the sequences of injuries or an arthritis. The symptoms which they produce are sudden pain and locking of the limb. If this occurs in the knee joint it will frequently cause fainting. The particles may become lodged in a pouch of the joint and remain in such a recess without producing symptoms for a long time. They may re-appear suddenly between the friction surfaces of the joint as a result of even slight injury. It is frequently extremely difficult to locate a loose body, and for its removal the joint may require to be opened, perhaps widely; even by an open operation the particle may not be found. The condition may be totally disabling. (For **Loose Cartilage,** *see* **Knee.**)

Tuberculous Disease of a Joint.—A disease which is common in childhood as a primary affection; it may succeed to injuries not necessarily severe. Such an event can be explained by (*a*) traumatism diminishes the normal resisting power of healthy tissues to invasion by the bacillus of Koch; (*b*) it awakens into activity a latent disease; (*c*) it hastens the extension of tuberculous bone foci into a joint.

Possibly the disease is secondary to an infection in the lungs, glands or elsewhere. This primary focus may not be revealed by clinical or even by anatomical examination, so that while opinions lean to the view that tuberculous disease of bones and joints is secondary, it is not absolutely impossible for the disease to be primary. The bacillus may be introduced into the system by inhalation, by food, or through wounds, and the primary focus may evolve at the point where the germ is deposited. It is not believed that the bacillus can be directly introduced from without through unbroken skin. As regards the localising influence of traumatism (non-penetrating), it is thought that the extravasation of blood following the injuries arrests the bacillus, which may be floating in the circulation, and retains it in a place favourable to its growth.

Max Schuller and Krause show experimentally that a slight traumatism to a joint determines the localisation of microbes in the case of animals experimentally infected with tuberculosis. (Hektoen and Riesman.) To establish the relation of traumatism to a tuberculous joint, first, the disease should develop in the injured part; second, there should be distinct evidence of injury; third, the affected part should show signs and symptoms of an essentially chronic disorder. If the disease is well established at the time of the injury, the symptoms may be acute, and a similar sharp course may ensue in a case of injury to an old healed or anchylosed tuberculous joint.

The usual history is that the swelling in a joint, which may at first have all the appearances of a simple synovitis or arthritis persists, and the pain does not disappear after the usual period of rest, the joint structures become thickened and there is a tendency to contracture; there is also distinct spasmodic anchylosis.

Such a condition will most likely be regarded as suspicious if it does not resolve in a month, and in six months the diagnosis will be usually settled with certainty. In the earlier stages a radiograph will sometimes show erosion of, or perhaps a centre of infection in, a bone. The disease in its course destroys capsule, cartilages and bones, finally abscesses form and discharge. If it is recognised early and the patient submits to treatment by complete rest of the part, and can obtain a period of residence in a sanatorium or some such open-air restorative treatment, the result may be excellent. On the other hand, if the disease progresses there may be as a sequence amyloid disease of the liver or kidneys, general tuberculosis, infection, amputation of a limb, resection of a joint, death.

One serious effect of **injury** to a **joint** the **subject** of **latent** or **healed tuberculosis** is that there is very great risk of the disease being disseminated through the system; the internal organs, specially the lungs, are liable to be involved, such a calamity being of the gravest import. (*See* **Arthritis. Tuberculosis.**)

JUTE.—A vegetable fibre used in the manufacture of sacking, rope and twine. A good deal of dust is given off in the jute factories; this is irritating and produces hoarseness, bronchitis, pneumonia. Occasionally tetanus (q.v.) has occurred among the workers due to the fibre having become infected. New hands in these jute works sometimes suffer from a mild fever, headache, backache; this usually subsides in two or three days. Deafness is also not uncommon.

KELOID, Cheloid. (*See* **Cicatrix.**)

KIDNEYS.—The organs which secrete the urine. They are situated deep in the abdominal cavity behind the peritoneum opposite the 12th rib; each weighs $4\frac{1}{2}$ oz., is 4 in. long, 2 in. broad and 1 in. thick. Each kidney is connected by a ureter with the bladder, which conducts the urine into the latter viscus. The ureter is about 12 in. long, its upper portion in the kidney being widened into a funnel shape and called the pelvis.

The kidney is liable to be injured by crushes, blows on the back, by fractures of the 11th or 12th ribs, or injuries to the last dorsal and upper lumbar vertebræ, by blows or contusions of the abdomen, forcible doubling up of the trunk, falls on the feet or buttocks, falls astride a beam, by lifting heavy weights, and by violent efforts.

Watson records a unique case in which the kidney was torn in two by falling a distance of twenty feet on hands and knees. Hæmaturia after injury, then clear urine, operation on sixth day for increasing tumour, enormous collection of blood found, eventual recovery.

After injuries to the kidney, which cause rupture of its tissue, blood may appear almost immediately in the urine (hæmaturia), or it may not appear until some time has elapsed, as either the pelvis of the ureter or the laceration may be blocked by a clot ; when the clots pass, the blood may then appear. If the laceration does not open into the pelvis of the ureter, no blood will pass, but inflammation (traumatic nephritis) may be set up or an abscess form, which later opens into the ureter (pyonephrosis), and pus be found in the urine, or the abscess may burrow into the loin (perinephritic abscess) or inside of the thigh. Suppression of urine is also likely to follow injury. In many cases of even extensive rupture of the kidney there will be little evidence of injury to the abdominal wall, but later, perhaps six or seven days, there may be extensive ecchymoses over the loin and side of the abdomen.

There may be sometimes found on examination a lumbar tumour produced by effusion of blood, either in the kidney or round it. In most of these cases where the laceration of the kidney is severe, or involves the peritoneum, the patient must be subjected to early surgical intervention, or death will be almost certain to ensue. Trauma may cause, without the appearance of hæmaturia, acute or chronic nephritis (*see* **Bright's disease**), which may get well, or may go on progressing to a fatal issue.

Thoinot quotes a curious case of Potain's in which the left kidney was injured by a contusion. There was hæmaturia for fourteen days, then followed œdema of the face and limbs, which was most marked on the left side. This disappeared, but recurred several times during the following years, with the same peculiar localisation. Fourteen years after the injury there was albuminuria and painful micturition. (*See* **Albumin. Hæmaturia.**)

Hydronephrosis.—A collection of urine in the pelvis of the ureter, causing distention and destruction of the kidney. This may follow injury directly affecting the internal structure of the kidney and ureter, such as rupture and displacement of a clot which blocks the ureter; impaction by a loosened stone, which may have been previously quiescent and produced no symptoms; injury to ureter, causing later cicatricial contraction and stricture (ureteral stricture). This form of traumatic hydronephrosis has been known to follow kidney injuries, and be recognised two years after (Pye Smith). A patient of Lepine died from uræmia ten years after an injury to the left kidney: at the *post-mortem*, hydronephrosis and stricture of the ureter were found (Thoinot).

Morris notes traumatic cases recorded by Croft, Hicks, Solier.

Injury acting outside the kidney can produce it, as in displaced kidney (floating kidney), in which the ureter becomes kinked or twisted, compression by extravasation of blood, pus or urine round the kidney or the course of the ureter. The condition may be serious, and operation required for relief of pent up urine or pus.

Septic inflammation of the bladder, and the extension of this to the ureters and kidneys, may follow injuries to the spinal cord; septic inflammation of the bladder and kidneys may also be a sequence to such injuries affecting the bladder and urethra as require the regular passage of a catheter for the purpose of drawing off urine.

It will be easy to understand that a patient suffering from a latent hydronephrosis may readily have it ruptured, by blows, strains, &c. Monprofit reports a case in which rupture was caused by pressure against a table during a scuffle.

The **formation of gravel or stone in the kidney** as a sequence to wounds, shocks or contusions of the kidney, must be of rare occurrence; but it seems quite possible that a stone may form on a nucleus of blood clot, fibrin or desquamated epithelium, these centres for its formation having been produced by trauma. Patients confined to bed after severe injuries, such as fracture of the lower limb, &c., and being for this immobilised in splints, and the conditions of their life altered, may sometimes suffer sharp attacks of renal colic (Ollive and Le Meignen). Injury can readily break off or dislodge a small portion of a renal stone (renal calculus), its passage down the ureter causing the violent agonising pain known as **renal colic.** The small stone, when it arrives in the bladder, may itself be the nucleus for the formation of a larger bladder stone (vesical calculus). Full working capacity will usually follow a simple attack of renal colic.

Carcinoma of the Kidney.—Cancer of the kidney. This has been known to follow injury. Golebiewski quotes Lowenthal's case from Thiem, in which the relationship was established, death having ensued seventeen years after the accident. (*See* **Cancer.**)

Sarcoma of the Kidney is a malignant disease which occurs more frequently in the young ; it may be congenital. In regard to its evolution in the kidney, Hektoen and Riesman state that trauma seems to play a distinct rôle, and that this may explain the occasional tendency to the development of sarcoma in floating kidney. (*See* **Cancer.**)

Tuberculosis of the Kidney.—Tuberculous disease of the kidney is comparatively frequent. The bacillus may be carried by the blood, or there may be an extension of infection from neighbouring organs such as the suprarenal bodies or the genito urinary tract.

While injury cannot create the disease, it is possible that it may occasionally prepare the part, and make it an easy prey to infection. There can be no doubt that injury can awaken into activity a dormant focus, or accelerate the course of an affection which has already exhibited clinical manifestations. (*See* **Tuberculosis.**)

Aneurism of the Renal Artery.—This is a very rare condition. It has as a primary etiological factor arterio-sclerosis. Keen, Morris, Teigler and Higgins, have collected in all twenty-three cases. In thirteen of the twenty-three there was a history of injury, in seven no injury was sustained, in three there was no obtainable history (Casper). (*See* **Aneurism. Arterio-sclerosis.**) If it could be detected early it might be within reach of operative treatment.

Floating Kidney. Movable Kidney. Nephroptosis.—In this the organ may have a range of movement varying in degree from slight displacement from its bed up to free movability in the abdomen.

The disorder is found most frequently in women, the commonest causes assigned being tight lacing, pregnancy, wasting diseases, congenital tendencies, as a part of a general downward prolapse of the abdominal viscera (Glenard's disease). Growths, tumours, may drag or displace the kidney. Nephroptosis is not common in males.

The displacement may follow blows on the loin or side, falls on the abdomen (Golebiewski, Thoinot), a jerk, falls on the feet (Henoch, Morris), heavy lifting, coughing, straining at stool (Casper), muscular action, as when after slipping a person tries to regain his equilibrium and in doing so involuntarily contracts the quadratus lumborum, erector spinæ, and the abdominal muscles (Golebiewski). Thoinot would reject effort, a series of efforts, or a fall as primary causes, but he would admit them as contributing to the complete prolapse of a kidney already predisposed to abnormal mobility. The symptoms are, at the moment of injury, great pain in the back. If the ureter becomes kinked the urine may be retained, and cause pain by distension ; this pain disappears with the voidance of a quantity of urine (Dietl's crisis). (*See* **Crisis**.)

There will usually be other symptoms of a neurasthenic character, vomiting, dyspepsia, &c. The kidney will be found out of its usual situation, and is tender to touch. There may be symptoms of uræmia (*see* **Bright's disease**), which may pass off (Newman).

The displacement may cause considerable incapacity for work, and if the kidney cannot be retained in its normal position by a suitable abdominal belt, the operation of **nephrorraphy** (stitching the displaced kidney in its place) may be carried out, usually with much success. It has, according to Jacobson, a mortality of 1 to 2 per cent. Absolute cures 83.5 per cent. (Watson).

The operation of **nephrectomy** (removal of a kidney), which may be necessitated by injury or disease, has a mortality of 28.4 to 44.1 per cent., Tuffier (Jacobson). If a patient recovers he is unable to undertake heavy work.

Rupture of the ureter may follow on injuries to the abdomen or pelvis; they will usually be masked by the severe associated damage, and if not diagnosed would be fatal from extravasation of urine.

The Supra-renal Glands or bodies are ductless glands situated on the upper extremity of the kidneys. (*See* **Addison's disease.**)

KNEE JOINT. (*See also* **Joint. Femur**).—The articulation between the lower end of the femur and upper end of tibia and patella. It is surrounded by strong ligaments, the anterior and posterior and the internal and external lateral ligaments, the spaces between these being filled up by the capsular ligament. Inside the joint there are the internal and external crucial ligaments, and the internal and external semilunar cartilages. These cartilages are oval in shape, and lie on the upper or articular surface of the tibia; the anterior and posterior end of each semicircle is attached to the tibia; the circumference, which is the thickest part, is incorporated with the joint capsule. From this each cartilage shelves rapidly towards the centre, and so serves to deepen the upper end of the tibia and act as a cushion, and make a cavity for the lower end of the femur. The patella or knee-cap slides freely over the anterior aspect of the lower end of the femur, and completes the bony structures of the joint. The movements of the joint approximate to that of a hinge (ginglymus joint), and in addition there are gliding and rotating actions. These actions are produced by the very powerful muscles which surround and assist the ligaments in maintaining the stability of the articulation. The synovial membrane which lines the interior is the largest in the whole body, and it frequently communicates with the bursa under the popliteus muscle; it may communicate with the joint between the upper ends of the tibia and fibula. Another bursa lies under the tendon of the semi-membranosus, where it is inserted into the internal tuberosity of the tibia beneath the internal lateral ligament. This bursa does not communicate with the joint. The synovial membrane also extends upwards for two inches above the articular end of the femur, and communicates with the subcrural bursa under the quadriceps extensor muscle. In front of the patella, under the skin, is still another bursa which has no connection with the joint; this is the one which becomes diseased, and is then known under the names, Housemaids' Knee (q.v.), Beat Knee. (*See* **Bursa.**)

The subcutaneous bursa over the tubercle of the tibia is also cut off from the joint; it sometimes becomes inflamed in those whose occupation necessitates constant kneeling (pretibial bursitis).

These bursæ may become inflamed from direct injury, or from wrenches or contusions, and it is a matter of some importance as to whether they are in communication with the knee joint or not.

For contusions, sprains, laxity of a joint, loose bodies, inflammation, Charcot's joint, *see* **Joint;** also **Anchylosis. Arthritis. Synovitis.** A considerable amount of **Atrophy** (q.v.) **of muscles,** particularly in the thigh, is very frequently observed after injuries to the knee joint. This condition has been the subject of much discussion. Some authorities, Bum and others, have held that the muscular atrophy which ensues after injuries, causing arthritis or synovitis, has as its preponderating cause the immobilisation and want of use required in the treatment of the early stages of the inflammation; others, Hoffa for example, consider that it is a reflex atrophy, due to irritation of the articulation, which may show itself in patients who have not remained in bed, and that inactivity contributes secondarily to the atrophy. Sudeck supports the reflex theory, and says that the disease is analagous to acute bone atrophy (Sand, *Bulletin des Accidents du Travail,* February, 1907).

Bailey relates an interesting case. A healthy man, aged 37, was injured in the right knee by a baseball. There was great pain at first, which soon diminished; four months later the pain recurred, no redness in the joint, but the leg was getting smaller, and a cane was required for walking. An operation was done eight months after the accident; no pus found, but the bone was soft and chipped. After this the pain became less, but the result of a walk of half a mile was that the knee again became painful. An examination two and a half years after the injury showed that the joint symptoms had subsided, but the patient suffered pain on exertion, and could not do any work which required standing or walking. There was atrophy of the whole lower extremity, circumference of right calf one inch less than the left, right thigh one and a half inches less than the left. There was reduction in both faradic and galvanic excitability, no reversal of normal re-actions, no further evidence of nervous disease, knee joint movable, not painful, and no signs of internal disease.

I have seen a somewhat similar condition in a man of thirty-eight who wrenched his left knee. There was considerable effusion, and he remained in bed nine days. On my first examination, three months after, there was weakness of the knee, relaxation of the internal lateral ligament, and abnormal mobility in the left internal semilunar cartilage; the muscles of the thigh were distinctly wasted, but the loose cartilage and relaxed ligament seemed the most serious matter. At the last examination, fifteen months after the injury, the internal lateral ligament was still relaxed, but the semilunar cartilage appeared to be fixed. The circumference of the injured limb above the patella, and at the middle of the thigh, was one inch less than on the sound side; the measurement round each calf was equal. There was no distinctive evidence of central nerve disease. In the matter of treatment the patient had massage after the subsidence of the effusion, and then walked about with the aid of a stick. A later examination with the galvanic current showed that degenerate changes were active in the muscle; it responded as well to the anode as to the cathode.

Both these cases tend to support the opinion that the atrophy of muscle which follows injuries to the knee joint is more than atrophy of disuse. I believe it does get well eventually, but recovery is a slow and tedious process. Systematic massage and faradism, with the dietetic and hygienic treatment required, are expensive necessities for an injured workman. This condition is fully described by Sir William Gowers under the name Acute Articular Atrophy, and a most detailed research is recorded by Mally and Richon in the *Revue de Chirurgie,* 1904–5.

Fractures. (*See* **Femur. Tibia.**)

Wounds of the joint are frequently septic, and are most serious injuries. A septic synovitis or arthritis (q.v.) will probably follow. This may resolve and a fairly useful joint result, or it may progress and end in septicæmia, anchylosis, amputation.

Aneurism of the popliteal artery may be a sequence of injuries, direct or indirect, to the knee. This is a dangerous condition, and may require amputation through the thigh.

Dislocations are not very common; they may occur in a forward, backward, inward or outward direction. The violence which causes such severance of strong ligaments must be extreme. They may be complicated by injury to vessels, and gangrene ensue, or they may be compound, and so there may be a danger of septic arthritis. Simple dislocations may be well in two to four months, but the joint is often permanently weak.

A form of Subluxation or Partial Dislocation is met with, in which there is a good deal of relaxation, or even rupture of the lateral ligaments. It frequently follows bad sprains, or fractures of the upper end of tibia or lower end of femur united with deformity. There is often atrophy of muscles, and the patient suffers pain when kneeling. The leg has the appearance of knock-knee or bow leg, according to whether the displacement is inward or outward. If it follows fracture the affection is permanent, and the incapacity for work considerable; if there is a relaxed ligament, a supporting knee cap may help the patient to do some easy work.

Dislocation of the Semilunar Cartilages.—Internal derangement of the knee joint. These cartilages are very liable to injury, particularly by strains, wrenches, twists, or direct injury (Fowler). When the knee is in a slightly flexed position, a force producing rotation outward of the tibia is likely to cause displacement of the internal cartilage, while rotation inward tends to displace the external cartilage. Under such circumstances a cartilage may be torn free at its circumference, the ends remaining attached, or the anterior end may be detached, and be felt at the side of the ligament of the patella, or curl up under the end of the femur; or, again, it may be completely separated. These tears are seldom repaired, so that recurrences of symptoms are frequent. Immediately after the injury the patient is in very great pain, and is unable to straighten the limb (locked joint). There is usually a good deal of swelling in the joint, and a rest of at least eight weeks is required so as to put the cartilage under the most favourable conditions in the hope that it may become anchored in its normal situation. After the acute stage has subsided, bandages and knee trusses are sometimes very useful in assisting to retain the displaced cartilage in its proper place. This may be attended with a great measure of success, provided no very heavy strains are put on the joint. The operation of removal of the cartilage, or suturing it into position, may be necessary, and it is a somewhat serious procedure on account of the risk of septic infection of the joint. If the cartilage is at all damaged it is best removed; patients do quite well, and are often able to undertake strenuous physical exertion after its removal. Although many cases do well after the operation for loose cartilage, it is not invariably successful, and this is probably due to the association of other injuries; for instance, a small chip of bone or cartilage, &c., may be hidden in some deep recess of the joint, and be undiscoverable at the operation; but when the patient begins to walk about this loose body thrusts itself between the articular surfaces, and produces symptoms almost identical with its prototype, loose cartilage. (*See* **Joint. Loose Bodies.**) The after results of such a disorder may be serious.

Robert Jones mentions two patients who refused operation: one developed rheumatoid, and the other tuberculous changes.

A proliferation of fat in the synovial layers of the joint may give rise to the **lipoma arborescens.** This may follow a traumatism, or the chronic irritation produced by foreign or loose bodies in the joint; sharp sudden pains are caused, and there is much wasting of the muscles; cracklings may be felt on movement, and a soft semi-elastic swelling may be seen on each side of the patella. The usefulness of the joint may be diminished or totally abolished (Hoffa).

Knock Knee.—Genu Valgum. A condition in which, when the knees are put together, the ankles are apart; the legs form the sides of a triangle whose apex is at the point where the knees touch each other. This may follow dislocations and fractures of either tibia or femur near the knee, or rupture or relaxation of the internal lateral ligament of the knee joint.

Out Knee.—Bow Legs, Genu Varum, Genu Extrorsum. An outward bending of the legs at the knee. This may also follow fractures, dislocations, and injuries at the knee. Both these conditions are usually due to rickets in childhood. The disability in walking is dependent on the amount of deformity. It may be found to be answerable to operative treatment.

Patella. Knee Cap.—This is a sesamoid bone developed in the tendon of the quadriceps extensor muscle of the leg. It works over the articular surface of the lower end of the femur. It is an irregular triangle placed with the base up; to the apex is attached the strong **ligament of the patella,** extending down for about two inches, and inserted firmly into the tubercle of the tibia.

Dislocations may occur outward, inward, upward, and there may be a rotation dislocation. They may follow direct violence, or be due to sudden spasmodic muscular action; they may be congenital. They are usually easily reduced, but liable to recur. Partial dislocations are not uncommon. After reduction they require from three to twelve weeks for recovery. The permanence of the incapacity for work will depend on the extent of the associated rupture of the tendons. Recurring dislocation is a serious disability.

Fractures occur from direct violence, or from muscular action, as in slipping suddenly and violently bending the knee, when the patella snaps in two; the line of fracture in this case will be transverse. Fractures may be vertical, oblique, comminuted, compound. A compound fracture is dangerous, and other forms of fracture are difficult to treat. Union of the fractured ends by bone is not always secured, and if there is much tilting of the fragments, ligamentous or fibrous union (*see* **Callus**) results, and disability ensues. Even in the best position ligamentous union is followed by a weak, but often a very useful limb. If adhesions in or about the joint follow, then the usefulness of the limb is much impaired.

In simple cases a patient will not be able to resume his occupation for at least two months; in the comminuted or severer forms, in which operative treatment is carried out, the length of time will depend on many conditions, such as the health of the patient, the formation of bony or strong fibrous union, &c.

Insurance allowance from 20 to 33⅓ per cent. at first, diminishing as improvement begins; if there is wide separation of the fragments 33⅓ to 50 per cent. (Golebiewski).

Rupture of the Ligamentum Patellæ.—Partial or complete. The partial may occur in connection with sprains or wrenches; it leaves a relaxed knee joint, and difficulty in extension of the limb. If there is complete rupture there will be great weakness and insecurity in the limb, and considerable wasting of muscles.

Operative treatment will be necessary in case of complete rupture. **Rupture of the quadriceps tendon** may occur just above the patella, and will produce the same disability as rupture of the ligament or fracture of the patella. The best result will be after suture, allowing about two months for repair. (*See* **Femur.**)

KNYSNA WOOD. (*See* **Boxwood.**)

KYPHOSIS (Humpback).—Abnormal backward curvature of the vertebral column. It may arise from various causes: it may be merely a senile change, it may occur in rapidly-growing children, it may be due to the action of the occupation or trade of the individual, it may be due to disease in the vertebræ (caries of the spinal column, Pott's disease, rheumatoid arthritis, spondylitis deformans, osteitis deformans, rachitis). It may ensue after paralysis of muscles or fractures.

Kummel's Disease is also known as spondylitis traumatica; it is an arthritis deformans (*see* **Arthritis**) of the spinal column. Absorption of the anterior portions of the bodies of the vertebræ causes them to sink together, and cause a forward stoop of the body. The kyphosis is a fixed one. It may be excited by slight trauma, either direct or indirect. There may be a little pain at first, and possibly few signs of contusion; then there is sometimes a period of quiescence, and several months later there are symptoms of intercostal neuralgia, and disturbances of sensation. The disease may become arrested at this stage, or it may progress, and the humpback condition (gibbosity) show itself. Frequently scarcely any notice is taken of the condition if the patient remains at rest in bed, and it is only when he begins to walk about that the kyphosis develops.

Radiography is very useful as an aid to diagnosis, and it may show a fracture or absorption of bone. The disease may cause total incapacity for work. (*See* **Spine.**)

LATERAL SCLEROSIS.—A disease due to hardening of the lateral columns of the spinal cord. It is characterised by rigidity of the muscles of the lower limbs, and increase of knee-jerks. If it is a primary disease there will probably be no disturbance of nutrition or sensation ; but if it occurs as secondary to a myelitis (q.v.), or cerebral apoplexy (q.v.), there will frequently be, in addition, wasting of muscle and disturbance of sensation. Some authorities hold that the disease is always secondary to changes in other parts of the central nervous system.

Amyotrophic Lateral Sclerosis is a disease in which the lateral columns of the cord and also the grey matter of the anterior horns are affected. In this there is very marked wasting of the legs and arms ; they become stiff and weak, speech may be affected, and swallowing difficult ; the reflexes are greatly exaggerated.

These diseases are slow and gradual in their onset and progress, they cause incapacity early, and are incurable.

Their precursors are frequently found to be trauma, exposure to cold, over exertion, inflammation of the cord, possibly syphilis. The kind of trauma which would be most likely to produce such diseases would be that in which the spine is involved, falls or blows on the back, wrenches or severe strains, these producing either minute hæmorrhages or setting up an inflammatory focus which slowly progresses. It is also possible that the injured person may have a tendency to, or be actually in, the prodromal stages, and the trauma merely develops what was previously passing unnoticed. (Erb).

LEAD (Lead Poisoning. Saturnism. Saturnine Poisoning. Painters' Colic. Plumbism).—Workers in any process involving the use of lead, its preparations or compounds, or workers handling lead, its preparations or compounds, are liable to suffer from poisoning.

The lead may enter into the system by the lungs, mouth or skin. The disease may be acute or chronic in its course.

The acute form generally arises from a large dose of the poison, while the chronic form ensues from small doses frequently repeated. Lead in one form or another is used in a very large number of industries; in addition, it may be contained in water, wine, cider, &c., which has been stored in lead containers. In acute poisoning the symptoms may appear rapidly, or they may not develop until some weeks after contamination. There will often be vomiting, pains in the abdomen, collapse; in a less severe form of poisoning there will be anæmia and sharp abdominal pains (painters' colic, lead colic). This is often accompanied by cramp in the extremities.

In chronic poisoning there will be a distinct blue line in the gums, but in cases where the teeth are absent, or in persons whose teeth are carefully attended to, the line may not be present. Anæmia, yellowish complexion (icterus saturninus), fœtid breath, dyspepsia, constipation, colic, pains in the joints (arthralgia), paralysis (lead palsy, paralysis saturnina): in these paralyses there is muscular atrophy, and the reaction of degeneration is often present. (*See* **Atrophy. Electricity.**) The musculo-spiral nerve is frequently affected, and there is consequent drop wrist; the supinator longus muscle usually escapes. The muscles of the upper arm (the deltoid biceps, brachialis anticus, and supinator longus) may be affected with paralysis. The muscles of the thumb (thenar) eminence, and ulnar side of palm and little finger (hypothenar) eminence, are wasted, and also the peroneal muscles (on outer side of leg) and extensor muscles of toes, causing "stepping gait." The respiratory muscles may be affected ; there may also be a febrile form of paralysis, with rapid wasting of the muscles of the limbs. The brain may suffer ; there may be epilepsy insanity, delirium, coma, optic nerve atrophy and blindness ; degenerations take place in the kidneys, and indican is frequently found in the urine ; arteriosclerosis (q.v.) and heart affections are common. Scheduled.

LEUCÆMIA.—A fatal disease, recognised by definite changes in the white corpuscles of the blood. It may be fatal in two months ; it usually lasts from one to three years. Three forms are observed : Chronic Myelogenous or Splenomedullary Leucæmia, Acute Lymphatic Leucæmia or Acute Lymphæmia, Chronic Lymphatic Leucæmia or Chronic Lymphæmia. The diagnosis of the condition is entirely based on a microscopic examination of the blood.

The myelogenous type is distinguished by the presence, in large numbers, of myelocytes or bone marrow cells ; these are not present in normal blood. The red corpuscles may not be diminished in number, but nucleated forms are numerous. There are also certain clinical signs, such as enlarged liver and spleen.

In the lymphatic type the increased white corpuscles are mostly lymphocytes ; these exist in normal blood in two forms, the large and the small ; they number for the small about 20 to 30 per cent., for the large 4 to 8 per cent. of the total white corpuscles. In acute lymphæmia the large lymphocytes predominate ; these are believed by some to be really an earlier stage of the myelocyte. In chronic lymphæmia the small lymphocytes amount to as much as 90 per cent. of the total white corpuscles ; in lymphæmia the red corpuscles and diminished forms are rare. In lymphæmia hæmorrhages and ulcerations are present, and the spleen may be much enlarged ; lymphoid growths are found.

In all types of leucæmia the white corpuscles are enormously increased. Taking the normal number as 5,000 to 10,000 per cubic millimetre, the number in this disease may reach as high as 450,000. The symptoms are steadily-increasing weakness and anæmia; hæmorrhage from the gums, stomach and lungs, are common, and blood may appear in the urine; there may be headache, dizziness, deafness. Death frequently occurs from œdema of the lungs or pneumonia. As to the cause of the disease we are in total ignorance; yet traumatism is sometimes alleged to be the exciting agent, and, as the etiology of leucæmia is obscure, the relation with traumatism cannot be rejected *a priori* (Sand). The disease has been attributed to accident when the injury has taken effect on the region of the spleen (left hypochondriac region), or there has been a severe injury to bones, or profuse hæmorrhage or shock. Rohmer notes the three cases recorded by Herrman, believed to be due to injury to the spleen, bones, and general shock. At the onset there were symptoms of traumatic neurosis; leucæmia was proved to exist from some months to two years after the accident. Osler states that the disease has followed injury or a blow. Ollive and Le Meignen admit the possibility of injury as an exciting cause.

I am acquainted with the case of a collier who stated he was injured on June 14th, 1904, while lifting stones. He said that he strained his back and side. When seen on July 5th, 1904, he had a plaster on the left side, and said that he brought up blood at the time of the accident. Nothing distinctive could be detected, and he was believed to be exaggerating. He was away from work for nineteen weeks, he then returned for five weeks. When at work on December 2nd a stone from the roof fell on his head, and caused a severe scalp wound which bled very freely. This was dressed, and appeared to progress normally; on December 22nd it again bled profusely, but eventually it healed. On examining him on February 3rd, 1905, he was found to be anæmic, and suffering from attacks of hæmatemesis and breathlessness, the spleen being greatly enlarged, and albumin present in the urine. In this case, while there might properly be some doubt as to whether or not the strain was the primary exciting factor, it is certain that the profuse hæmorrhage which followed the scalp wound accelerated and aggravated the disease. He died in 1907 from an attack of hæmatemesis.

LIPOMA (a fatty tumour).—These are usually painless and benign in their course. They may produce ill-effects by pressure on important structures; they frequently follow injury, and are seen on the hands of working people; they may arise also in scars. These tumours are often seen, apart from injury, on the back, axillæ, groin, buttocks; they appear generally in adults, and are not a monopoly of fat people.

LIVER.—The large glandular organ which secretes bile. It has also other important functions, such as the formation of glycogen and the conversion of nitrogenous matters into urea, &c. It is situated in the right and left hypochondriac and epigastric regions. The weight is about 50 oz.

Severe contusions and wounds of the liver are frequently fatal from hæmorrhage. The contusions usually occur from buffer accidents, blows from poles of wagons, and such-like injuries. In these there is often extensive rupture; a slight traumatism may cause rupture of an unhealthy liver. If the injury is slight and the patient recovers, or if there has been a successful operation for a rupture, there will be probably the formation of adhesions to other organs, which may cause pain and interference with functions, and consequent incapacity for work.

Movable liver may follow injury which has damaged its suspensory ligaments, such as falls from a height, passing of a wheel of a vehicle over the body. In such cases the symptoms would be great pain, and there would be evidences of displacement. Effort may produce a hæmorrhage into the liver (Sand).

Abscess of the liver may follow injury in as short a period as six days (Sand) ; but by far the commonest cause of this is dysentery, infected wounds, abuse of alcohol. **Hydatid cysts** occur frequently in the liver from the presence of the larvæ of the tænia echinococcus (tape worm of the dog) ; these cannot be created by injury, but it may favour their rapid growth. Slight trauma may easily rupture either a cyst or an abscess ; this may take effect immediately, or be delayed for several days (15 days, Frerichs, Stern). Abscesses or cysts may be drained by an operation, and full working capacity be restored in six to twelve months. Biliary colic may be initiated by traumatism ; a latent or quiescent gall-stone may be disturbed and pass into the duct, setting up a typical attack of pain, perhaps followed by jaundice. If the stone has passed there may be no further incapacity from the injury ; but as gall-stones are rarely single, other stones may be suspected, so the operative emptying of the gall bladder of its contents will be advisable. The prospect of full restoration to health is good.

Inflammation of the gall bladder may be a rare consequence of injury, and operative treatment may be urgently required. Rupture of the gall bladder or the ducts may also occur from injuries. The injury is very dangerous, but it may be possible to save life by early surgical treatment. Glycosuria may follow injuries to the liver. The mortality of operations by the Mayos on the gall bladder and ducts, as cited by Jacobson, is : gall-stones in the common duct, without infection, 2.9 per cent. ; infection in ducts with deep jaundice, 16 per cent. ; complete obstruction in common duct, the general state of the patients being bad, 34 per cent. (*See* **Diabetes. Cirrhosis.**) For the relation of malignant disease to trauma, *see* **Cancer. Jaundice.**

LOCOMOTOR ATAXIA (Tabes Dorsalis).—A slow, steadily-progressive disease of the spinal cord, in which there is degeneration of the dorsal columns of the cord and of the sensory nerve tracts. The disease is characterised by paroxysms of lancinating pains, loss of co-ordination in the movements of the legs, loss of sensation in the legs and feet, attacks of vomiting, incontinence of urine. The signs are the ataxic gait (unsteadiness and jerkiness in walking), swaying of the body when the eyes are closed, the feet being placed together (Romberg's sign) ; the pupils are contracted, they act to accommodation but not to light (Argyll-Robertson's sign) ; loss of knee-jerks. (*See* **Reflexes.**) The disease, like many degenerations of the central nervous system, may be so imperceptible in its onset and stealthy in its progress that frequently the condition goes unrecognised until the clinical picture is nearly complete.

In regard to ætiology, it is very generally held that syphilis holds the most prominent place ; but it is not the invariable cause. Gowers believes that it may be excluded in 10 per cent. of the cases. Sexual excess is also stated to be a cause, but Marie holds that an impure is more responsible than an immodest Venus.

The causal relation of traumatism and tabes has received full consideration by many authorities. That an injury can originate such a disease, and be the sole cause of it, is a proposition for which satisfactory proof will be difficult to produce ; but it must be admitted that there are cases recorded which favour markedly the view that there is such a disorder as traumatic tabes. Raymond, Dieulefoy, Klemperer, Leyden, Hitzig and others, admit the possibility. Ferrier thinks that trauma may precipitate or accelerate the onset in persons who have had syphilis. Marie rejects trauma, as also does Dejerine, Trommer, Becker. Bailey believes that it is probable that in most of the so-called traumatic cases the patients were in the pre-ataxic period of the disease at the time of injury. Osler, in enumerating the causes, mentions excessive fatigue, overwork, injury, exposure to cold and wet.

Whatever difference of opinions exist as to the disease originating after injury, there does not appear to be much room for doubt that injury can unmask a latent tabes, and also that it can aggravate the disease, and hasten its full development. The exciting injury may be one that acts directly on the spine, causing fractures, concussions, &c., that is to say it acts centrally; it may also act peripherally as in sprains, dislocations, and contusions of the lower limbs. The disease has been known to follow sprain of the ankle (Golebiewski).

I recently saw a case in which a workman had done his full work up to the accident, and who was not known to have had any previous illness. He sustained a severe contusion of the foot, and was confined to bed with the injury for some weeks: when he got up he was found to be in an advanced stage of ataxia. The disease progressed rapidly, and then seemed to become arrested for a short period; then advanced again, and the man became paraplegic, and died in about eighteen months after the injury.

In this case I think it would be assuming too much to state that the injury caused the tabes; yet one is bound to admit that the condition was very closely connected with the accident.

A point that ought not to be overlooked in these cases is that tabetics, even in the early stages, are more prone to falls and accidents, generally on account of the unsteadiness of gait, and some numbness in the soles of the feet. Another point of importance is that the nervous disorders of plumbism have a similarity to those of tabes. (*See* **Lead.**)

In respect to the question of aggravation, while it is true that injury may quicken the evolution of tabes, it does not always happen so. A case is mentioned by Bailey in which a patient in the early stage of the disease was badly bruised and contused in a railway accident.

He was confined to bed for a month, yet there was no accession of symptoms.

Charcot's joint may develop in a tabetic after injury: it is a condition of enlargement of the joint, generally the knee; it will probably greatly increase the incapacity for work. (*See* **Joint.**)

Tabes may last from one to thirty years: in the early stages many forms of very easy work may be done with advantage.

LORDOSIS. Spinal Incurvation or **Anterior Deformity** (Tubby) **Hollow Back, Saddle Back.**—Women of some races have this anterior curve normally (natives of Cuba).

It is present in all pregnant women, also when there is fluid or a tumour in the abdomen. Military men sometimes have this curve, and it may also be present in those who have habitually to carry weights on the head. This type is known as static lordosis. It may be present from disease in the joints of the spine, or partial dislocation of lower lumbar vertebræ, as a compensation curve in congenital dislocation of the hip, or in hip disease. It may be due to contracture or paralysis of muscles; it may be seen after such diseases as pseudo-hypertrophic paralysis, progressive muscular atrophy, acute anterior polio myelitis, conditions in which there is destruction or degeneration of muscle. (*See* **Spine.**)

LOWER LIMB.—For fractures and dislocations, see the various bones: **femur, tibia, &c**; for other injuries *see* **knee, ankle, foot, sciatic, crural, peroneal nerves, &c.**

Simple wounds and contusions of the soft parts of the thigh usually get well rapidly, but if the contusion is extensive and severe, atrophy of muscle may follow. Ruptures of muscles may require operative suturing, and if this is not feasible considerable incapacity for work may ensue. Insurance allowance for rupture of the semitendinosus muscle, and subsequent inability to flex the thigh vigorously, 15 per cent. (Golebiewski).

Wounds and contusions of the thigh, if they suppurate, may result in painful scars, or scars which contract and limit the movements of muscles. Wounds and contusions of the calf of the leg follow much the same course as those of the thigh.

Rupture of the muscles of the calf can arise from excessive exertion, or may occur spontaneously from muscular cramp. Rest for a few weeks usually cures this condition, but if there is wide separation of the ruptured ends operation may be necessary. For injuries to the achilles tendon, *see* **Ankle.**

The plantaris muscle is frequently ruptured: it is usually a very painful condition, which gets quite well in about four weeks. The tendons in the lower part of the leg may be injured directly or indirectly; they may become matted to their sheaths, and limit the movements of the ankle and foot (q.v.).

Sometimes tuberculous disease develops in these tendon sheaths. Injuries to the blood vessels occur, and aneurism or thrombosis of veins may follow, and produce serious incapacity. Varicose veins and ulcers are common in the legs.

Shortening of the leg follows not infrequently after fractures of the femur and tibia, as well as from injuries and diseases in the joints. If the limb is much shortened, there may be great incapacity for heavy work. Ollive and Le Meignen think that a shortening below about 1¼ in. (3 cm.) ought not to be indemnified when it is uncomplicated with other lesions. Brouardel speaks of great shortening as more than about 2 in. (5 cm.), and slight shortening as below that. He would value the infirmity at from 25 to 60 per cent., the higher figure applying to workmen whose employment requires the full and complete use of the lower limbs. Thiem thinks that below 1¼ in. (3 cm.) there is ready accommodation, and correction of the infirmity. There is no doubt that after a time a good deal of accommodation to the disability of a shortened limb will take place, and with the effect of treatment, so easily observed by means of radiography, only very severe injuries will show a shortening of more than 1½ in., and as a matter of fact a great deal of this can be overcome by increasing the thickness of the sole of the boot. If there results much bowing or bending, or if the line of fracture has been very oblique, or comminution has occurred, or considerable damage to the soft parts, the limb may be much weakened. Scudder thinks that in fractures of the shaft of the femur the degree of restoration of function cannot be determined with accuracy until about one year has elapsed after treatment has ceased.

With regard to shortening in fractures of the leg (tibia and fibula), this may follow from much the same causes as in the femur. In taking measurements of the legs, and in forming opinions on these, it is important to remember that in normal persons there may be a marked difference in the length of the two limbs. In fractures of the tibia there frequently follows, after union, a good deal of swelling of the leg and foot; this may be due to damage to the veins setting up thrombosis. (*See* **Embolism.**) It may cause pain and incapacity for a long time.

For malignant disease following injury, *see* **Cancer.**

To recognise a condition of **paraplegia** (paralysis of both motion and sensation in the lower limbs), in addition to electrical tests the following will be useful. Place the subject on the back across the bed, the pelvis and limbs being unsupported and out of the bed; raise simultaneously the two feet by grasping hold of one of the smaller toes; when there is no genuine paralysis the weight of the limbs diminishes gradually, and the examiner's efforts to sustain the elevation become less; at the same time notice the prominence of the patella, and the rigidity of the rectus muscles. When the rectus is rigid, if one lets a limb go suddenly it will remain poised in the air. If the paralysis is genuine the limbs remain a heavy dead weight, and fall lifeless if let go, and there will also most probably be evidences of loss of control of the rectum and bladder (after Olivier d'Angers).

In cases of dribbling of urine (q.v.). without any very evident cause, it is well to remember the observation of Page, in which the dribbling was due to enlarged prostate.

LUNGS.—The organs of respiration. They occupy the chest, and are separated from each other by the heart, great vessels and nerves. The lungs are conical in shape, with the base downwards; they are free except at the roots, where they are attached to the bronchial tubes and blood vessels; they are surrounded and enclosed by two serous sacs called the pleuræ; each pleural sac consists of two layers: the visceral, which covers the lung itself, and the parietal, which lines the inner surface of the chest cavity.

The right lung is divided into three lobes, and is larger and shorter than the left; the left has two lobes, and is smaller and narrower than the right. The trachea, or windpipe, is about 4½ in. in length, and extends from the lower border of the larynx (opposite lower border of 5th cervical vertebra) to the cartilaginous disc between 4th and 5th dorsal vertebræ, where it divides into right and left bronchial tubes; these subdivide into small and still smaller tubes, which act as air passages leading into the air cells of the lungs. Each air cell is surrounded by a network of minute blood vessels, and it is here that the blood takes up oxygen and gives up carbonic acid. The normal rate of respiration is about 17 per minute.

Injuries to the chest walls, which cause fractures of the ribs, may readily result in laceration of the lungs.

Contusions without fracture may also produce damage to the lungs, while falls from a height are also very likely to cause a rupture which may be slight or severe. Buffer accidents, in which the chest is involved, and such-like occurrences, nearly always result in extensive and usually fatal injuries. Penetrating wounds, bullets, &c., may also cause extensive tearing.

Contusions of the lung may follow injury to the chest wall or a fall from a height. The contusion may occur in association with fractures of the ribs, or without such damage. While it can be readily understood that the lung may be injured, if there is injury of a severe character to the thoracic walls, it is not quite so apparent why an injury which shows no effect on these walls can inflict a considerable hurt on the contained lungs ; but that there may be extensive harm done without external evidence of it there is little doubt, as many recorded observations prove. The theory of Gosselin serves to explain the matter. He propounded that a violent blow, say on the lateral wall of the chest, tends to straighten the curvature of the ribs ; thus pressed in, they compress the lung ; generally at the moment of injury there is a sudden closing of the glottis, and the air in the lungs is held there, so that they become less compressible, and consequently give way. The tear or rupture may be small or extensive. This depends on the force of the traumatism and the stage of the inspiration, the lung being most incompressible when it is full of air, as at the end of inspiration. Certain conditions favour the occurrence of rupture without fracture, such as the youth of the subject, old or active tuberculous disease, adhesions which are liable to be pulled on, and so cause a tear. The tear or contusion may occur at a distance from the part of the chest wall struck, and not necessarily immediately under it. While fracture of ribs and penetration of the broken ends into the lung may easily occur, it is not uncommon for there to be a fracture of the ribs and damage to lung tissue without there being any trace of injury to the parietal pleura. If the violence which has caused the contusion of the lung has also caused a rent in the visceral pleura, then a pneumothorax (air in the pleural cavity) may follow. The symptoms in the less severe degrees of contusion will probably be pain at the injured part, difficulty in breathing, possibly hæmoptysis ; on examination there will be dulness on percussion, and absence of breath-sounds over the area affected. In severe contusions death will ensue most probably soon after the injury.

If the patient survive, complications (*i.e.* pneumonia, &c.) of a more or less dangerous nature may follow, and these may be sequelæ to even the lesser degrees of injury.

Hæmoptysis is not always present even in severe injuries, as a blood clot may prevent the blood pouring into a bronchial tube, and its appearance may be delayed for from twenty-four hours to six days (Thoinot). Other serious complications which may follow are pneumonia, pleurisy, gangrene of the lung, tuberculosis.

Gangrene of the Lung.—Mortification of the lung. This may be a sequence to traumatic pneumonia, or it may directly follow injury to the lung ; it may also arise from a septic thrombus, the inspiration of fœtid substances into the air passages, or the presence of foreign bodies in a bronchial tube, the perforation of ulcers of the œsophagus and other organs into the lungs, or the pressure of malignant growths or aneurism. It also occurs in insane, alcoholic or diabetic patients. It seems probable from the recorded cases that traumatic gangrene of the lung is usually seated in the lung which corresponds to the side of the thorax injured, but this is not an absolute rule (Thoinot). The disease is due to microbic infection of a contused devitalised part. If it follows injury there may be immediately after some hæmoptysis, but this is not invariably the case. There is frequently an apyretic period, during which distinct symptoms are absent.

The period at which the characteristic fœtid odour of the breath develops is from the tenth day to the fifteenth ; this period may be prolonged for from three to four weeks.

Woillez (Ollive and Le Meignen) quotes a case in which the fœtid expectoration was noted for the first time six months after the accident, but there were during this interval attacks of hæmoptysis and cough. When the disease is established the symptoms and signs are the intensely fœtid odour of the breath, the greenish sputum containing fragments of lung tissue, hæmoptysis, and if the disease is superficial signs of a cavity in the lung may be discoverable.

Sometimes it is difficult to distinguish the disease from abscess of the lung or putrid bronchitis. It usually ends in death. (*See* **Gangrene. Phthisis. Pleurisy. Pneumonia.**)

Bronchitis. Broncho Pneumonia.—These may follow injuries to the chest: they are usually masked to a considerable extent by the painful symptoms associated with the injury; they develop in a few days after the trauma, and generally get well with it.

Concussion of the chest. (*See* **Concussion.**)

For pus in the chest cavity, *see* **Empyema.**

Hernia of the Lung.—A protrusion of the lung through the chest wall. It may immediately follow wounds, or develop later through a yielding scar; it may be a congenital defect, and come through some gap in the ribs, or be due to a high situation of the apices of the lungs, thus forming a sort of hernia above the clavicles (S. Paget).

In **wounds of the lung** the prognosis as to life may be fairly good if the patient escapes the dangers of septic infection and its consequences, empyema, septic pneumonia, gangrene. When recovery occurs, a considerable amount of incapacity for heavy work will usually result.

Hæmopneumothorax.—Blood and air in the pleural cavity.

Abscess of the lung may follow embolism, localised gangrene, tubercle, pneumonia, empyema, inhalation of foreign bodies. It is frequently fatal.

LUPUS.—A tuberculous disease of the skin. (*See* **Tuberculosis.**)

MALARIA.—A febrile disease caused by the presence of a parasite in the blood. The dormant disease may be awakened into activity by traumatism, more especially that which takes effect in the region of the spleen. (*See* **Mosquito.**)

MALIGNANT ŒDEMA.—Acute purulent œdema. Gangrene Foudroyante. A very dangerous disease due to infection by a bacillus which is common in soil (*Bacillus Œdematis Maligni*). It may accompany severe contusions or crushes of soft parts and bone, and follow insect stings. The disease develops rapidly, and putrefaction and decomposition, with the formation of gases, ensue in the wound ; there follows high temperature and symptoms of collapse. Death may result in from forty-eight hours to three or four days. (*See* **Œdema.**)

MALINGERING SIMULATION. (*See also* **Exaggeration. Provocation. Substitution.**)—The fraudulent imitation or feigning of symptoms or signs of disease. Such a condition ought to be considered quite apart from involuntary or even voluntary exaggeration. In the exaggerations we find that there has been an accident of some kind, and consequent injury of a more or less severe nature ; but in malingering the claimant knowingly and falsely creates certain symptoms and signs which he alleges have followed an injury, while as a matter of fact these are fraudulent inventions, and have no real existence. It must be clear that malingering in its pure form is rare, because if there is to be the least chance of a successful result the malingerer must be gifted with more than ordinary ability, and in addition he must have acquired a considerable knowledge of anatomy, physiology and pathology.

It is true that medical books are within easy reach of most people nowadays, and they may be studied for nefarious purposes ; yet, granting the full use of a medical library, the malingerer has to choose his disease. That choice is extremely limited, and it will be almost certain to fall on one of the nervous disorders. One disease which readily lends itself to such dishonest uses is neurasthenia, but the protean forms of this affection are so well understood that it is not very likely that the simulator of neurasthenia will go far without detection. In this, as is well known, the symptoms are mostly of the subjective order, that is to say they are not easily perceptible to the senses of others, yet, generally speaking, the trained faculties of the medical examiner when carefully brought to bear on the subject will usually be able to furnish a fairly reliable opinion. To be in the best position for furnishing reports on these persons, it is often necessary in order to arrive at a sound conclusion, to have them under observation for a period, and in difficult or obscure cases these observations should if possible be carried out in a hospital or institution, where a day and night record can be kept, and every variation from the normal noted. It is just in this type of case that the simulator scores something of a success, for he is often shrewd enough not to make too big a claim, and assurance companies will sometimes pay him off rather than incur the risk of what may be very much greater expense in resisting.

It will be interesting to consider in some detail the leading items of the simulator's stock-in-trade. **Pain** is perhaps the most often used symptom, and in regard to this it is beyond dispute that the medical examiner is never in the position of being able absolutely and positively to affirm and prove that pain does not exist in a given case; but it is a matter of common knowledge that some persons bear pain more easily than others, that the standard of endurance differs, yet, on the whole, a person who suffers from continuous or intermittent pain of an incapacitating character will, in all probability, undergo depreciation in his general health, suffer from sleeplessness, and give evidence of a continued strain on his constitution. At the examination the feigner of pain, when describing it, or on observing that the examiner is about to touch the alleged painful part, exhibits great distress or agony; but when the attention is diverted, or he is not looking, no complaint is made of a rapidly-increasing pressure, the cry of pain only comes when he realises what has been done to him.

Again, if one produces a genuine painful impression at some distance, say by means of a faradic battery, and at the same instant presses the alleged painful part, there will probably be no result as regards the latter; it will have passed unnoticed.

The Sign of Mannkopff if positive is very useful; it consists in an increased frequency in the pulse rate at the moment in which a painful sensation is produced. The ordinary rate of pulse in the subject is taken several times during the examination, and then pressure is made on the alleged painful part; if the pulse increases in rate by 25 to 30 beats per minute, it may be taken that there has been a genuine painful impression, as the simulator cannot voluntarily increase the pulsations of his heart.

The Sign of Bechterew.—Pressure on a really painful zone in addition to increase in the pulse rate causes a dilatation of the pupil, and an increase of blood to the face.

The Sign of Muller may occasionally serve a useful purpose. It is dependent on the law of Weber who found by experiment the least distances at which the two points of a pair of compasses could be separately distinguished on parts of the body, the double contact giving a single sensation inside these distances; for the tip of the tongue it is 1 mm. ($\frac{1}{25}$ in.), for the middle of dorsum of tongue 8 mm. ($\frac{1}{3}$ in.), for the palm of the hand 10 mm. ($\frac{5}{12}$ in.), for the dorsum of the hand 25 mm. (1 in.), gluteal and sacral regions 37 mm. ($1\frac{1}{2}$ in.), upper dorsal and mid-lumbar regions and back of neck 50 mm. (2 in.), middle of forearm and thigh 62 mm. ($2\frac{1}{2}$ in.), dorsum of foot 37 mm. ($1\frac{1}{2}$ in.).

In using the test the subject must be blindfolded and the so-called painful area marked out; at a distance from this area, a little inside the distance given for, say, the mid-lumbar region, 35 mm. for example, press with the finger. Pain is not complained of as the finger is felt outside the area declared painful. Now put another finger inside the area declared painful, the fingers not being a greater distance apart than 35 mm. According to Weber's law the subject will not recognise two fingers at this distance apart. Now press, and as he was aware only of the first finger and does not recognise that two fingers are pressing, one outside and the other inside the painful zone, if he is a malingerer he will not complain of pain. The temperature of the fingers ought to approach as near as possible that of the skin of the subject.

This sign is not by any means infallible, but it may help as an item in the cumulative evidence. In a pain of a neuralgic character it sometimes happens that pressure on the part relieves it; in this the pain is localised to a nerve whose distribution is well known, and it is accompanied by objective signs.

Anæsthesia of areas of the skin may be alleged. Various tests may be applied, such as mark out on the skin with a red crayon the limits of the alleged anæsthetic area; then blindfold the subject, and again mark out the area but with a blue crayon. A malingerer will require to be very astute to avoid wide differences in the extent of the regions so plotted out.

Unverricht's Electrical Test is useful. Place one electrode at a point where the sensibility is preserved or at the boundary of the anæsthetic zone but so that a point of this electrode is in contact with a sensitive region; place the other electrode on the anæsthetic zone. Now, if when the current is turned on the subject states that he does not feel anything, he is shamming.

The usual tests with a needle or pin and the use of warm and cold water in test tubes are all of importance and the results of these will assist in forming an opinion.

Tremor.—This is a symptom of disease in the nervous system which the malingerer generally performs " not wisely, but too well."

If tremor persists during sleep, or if its rhythm remains unaltered when the attention is diverted, it is probably genuine.

Fuch's Test is based on the fact that, without considerable practice in a particular movement, it is not possible to carry out with the right arm and hand, and also with the left arm and hand, simultaneous movements in opposite directions. For example, a person cannot trace simultaneously in the air with the left hand the letter B, and with the right hand the letter C, so the subject of tremor in the left hand is asked to trace in the air with the right hand these letters of the alphabet, the left or affected hand being held out. If it is seen that the left hand follows involuntarily the movements of the right, and that its tremors are interrupted, then there is no doubt that there is malingering.

For tremor in the lower limbs **the procedure of Seeligmuller** is of value. Place the subject on a couch lying on his belly, flex the two legs so that the feet are in the air ; in this position simulated tremor ceases.

Paralysis, if feigned, will be unmasked by an electrical examination, and if there is any degeneration of muscle or nerve the reaction of degeneration will be present. (*See* **Atrophy.**)

Hysterical paralysis, which is a disorder in itself, will be associated with the stigmata of the disease. (*See* **Hysteria.**)

Malingering or simulation in its various forms is not a by-product of modern civilisation, nor is it a direct outcome of the Workmen's Compensation Act, for is it not recorded in the historical book of Samuel that David was a successful simulator. We are told that at Gath, 1062 B.C., he was so sore afraid of Achish the king, that " he changed his behaviour and feigned himself mad, and scrabbled on the doors of the gate, and let his spittle fall down upon his beard." With such an excellent display of histrionics, no wonder Achish made an error in diagnosis and allowed him to escape to the cave Adullam. We must forgive David for his deception under such trying circumstances, and in extenuation of his conduct remember that if he had been unmasked we might have been deprived of that parliamentary institution without which political life would be as " the salt which has lost his savour."

No doubt other classic cases will be recalled to the memory of my readers, who possibly will agree that " all the world's a stage, and that men are merely players," and that those of us who by education and environment have achieved enough ethical strength, perhaps beyond our deserts, to resist playing the part of the villain in the cast, have something to be thankful for.

It has been mentioned that malingering is not very frequent. The statistics furnished appear to vary within wide limits : Hoffman and Schultze, 1890, put it at 33 to 36 per cent. ; Seeligmuller, 1891, declares that 25 per cent. of cases of traumatic neuroses are simulated ; Oppenheim, 1891, puts the figure at 4 per cent. ; Bruns, 1901, 8 per cent. ; Golebiewski, 1900, 2 per cent. In my opinion, malingering in its pure form as an art is extremely rare, exaggeration is frequent, substitution occasional, provocation exceptional.

In the examination of a claimant, it is very necessary that the examiner should be on the alert so as to avoid being deceived, and use all his skill and knowledge in the endeavour to arrive at a just conclusion. The exercise of much patience is requisite, while severe methods which, as Bailey says, suggest the Inquisition should not be used. The duty of the examiner is to seek out the truth with what light he possesses, and keep before his mind that " it makes all the difference in the world whether we put truth in the first place or in the second place." It is necessary to consider each symptom carefully, and it is unwise to discard anyone because it is unfamiliar to the practitioner in relation to the signs or the history of the trauma. The attitude of the examiner should be strictly impartial ; he should avoid on the one hand giving assistance to a simulator, and on the other eschew the bad habit of giving the name malingering to symptoms which he is unable to explain.

It seems hardly consistent with the best traditions of the medical profession that one should become notorious as a smeller out of malingerers ; an obsession which causes one to view every claimant as a malingerer is surely to be avoided. Apart from obvious fraud it is apparent that the more one understands about a case the less likelihood is there of bringing a charge of malingering. Wilbrand thinks that the examiner has no right to accuse a man of simulation when he is unable to demonstrate it objectively. He holds also that we see less of simulators when we have learned to understand the neuroses.

MANGANESE POISONING appears to be a very chronic disorder, as in the cases recorded it took about four years for development. The symptoms are akin to hysteria, and begin with laughing and weeping, then later inco-ordination in walking movements, and in some, mental derangement (Oliver).

MEDIAN NERVE.—It comes by two roots from the outer and inner cord of the brachial plexus. It is at first outside the artery (axillary), but at the middle of the upper arm it crosses the vessel (here called brachial), passes between the heads of the pronator teres muscle, down the forearm on the flexor profundus, and under the flexor sublimis muscles, and becomes superficial at the front of the wrist, where it is very liable to injury. It supplies muscular branches to pronator teres, flexors carpi radialis and sublimis, palmaris longus, flexor profundus (outer half), flexor longus policis, pronator quadratus, abductor, opponens and outer head of flexor brevis policis, three lumbrical muscles, skin of palm, palmar surface, and sides of outer three and a half digits (thumb, index, middle and half of ring fingers).

Injury to the nerve may cause weakness or paralysis of the muscles supplied, and loss of sensation in the palm and three and a half fingers, loss of grip. Paralysis is frequently associated with disturbances of nutrition in the parts, evidenced by blueness and coldness of the hand, its usefulness being greatly impaired. The diagnosis is not always easy, and the condition may be overlooked. If when the nerve is severed it can be joined up soon after the injury, good results may follow if the wound is not too badly infected. In a successful case return of power and sensation may be expected in about twelve months (Sherren). (*See* **Brachial Plexus.**)

MENIERE'S DISEASE (Aural Vertigo, Auditory Vertigo, Labyrinthine Vertigo).—A disease of the internal ear which causes sudden attacks of falling, with possibly some momentary loss of consciousness followed by pallor, sweats, nausea, and perhaps vomiting, and more or less deafness. The attacks may occur daily, or there may be intervals of weeks or months. The disease is believed to be due to a hæmorrhage or a degenerative process in the internal ear, or suppurative or other disease in the middle ear, or affections of centres of hearing and equilibration ; wax or disease in the external ear may cause the symptoms.

It may also follow injuries causing a fissure in the base of the skull, detonations, decompression (caisson disease), chills. It is frequently incurable. (*See* **Compressed Air Illness. Ear. Vertigo.**)

MENINGES.—The three membranes which invest the brain and spinal cord. From without inwards they are the dura mater, the pia mater, the arachnoid.

Meningitis.—Inflammation of the meninges. (*See* **Brain.**)

Meningeal Hæmorrhage.—Injury to the meningeal arteries may follow head injuries, and occur without fracture of skull. There may be an interval after the injury during which few symptoms are shown, yet the bleeding may be going on, and eventually cause death. The symptoms, when they develop, will be gradually progressing stupor, signs of unilateral paralysis. If the case can be diagnosed early, an intracranial operation may save life. (*See* **Apoplexy. Head Injuries. Pacymeningitis.**)

MERCURY (Mercurial Poisoning, Quicksilver Poisoning).—It is found in quantities in nature in the form of cinnabar, sulphide of mercury. Workers in the extraction of the metal suffer, as also those who use it in the older method of silvering mirrors. Mercury is used in the manufacture of thermometers, barometers, electric lamps, &c., in felt hat making, and as a dressing for furs.

The metal volatilises at a low temperature, and the vapours given off are dangerous. The workers who suffer become pale, anæmic, tremulous, giddy, and complain of headache ; in the more acute form the breath becomes fœtid, gums soft, swollen, ulcerated, the teeth loose. Phthisis and kidney disease are frequent amongst workers, while signs and symptoms not unlike those of general paralysis sometimes develop. The preventives are ventilation, cleanliness, mouth washes of alum and chlorate of potash, respirators. Work should not be carried out at too high a temperature. Scheduled.

MESENTERY.—The fold of peritoneum (q.v.) which connects the intestine to the posterior abdominal wall. If the term mesentery is used it generally refers to that of the small intestine. In relation to the cæcum it is called meso cæcum ; in relation to the colon, meso colon ; to the rectum, meso rectum. These folds contain the vessels and nerves that supply the viscera, and rents or tears may cause cutting off of the blood supply, and subsequent gangrene of the bowel.

Through such rents the bowel may become herniated and strangulated, and death rapidly follow if unrelieved by an operation. Thrombosis of the mesenteric veins or embolism of the artery may occur, and have symptoms almost identical with acute intestinal obstruction.

Mesenteric cysts are found : they may be ruptured by abdominal injuries. I have seen rupture occur during an attack of vomiting ; the condition was relieved by an abdominal operation.

METATARSALGIA (Morton's Disease. Painful Foot. Policemans' Foot).—A painful affection starting in the third, fourth, or fifth metatarso phalangeal joint. It may be brought on by a sudden false step, or by prolonged standing, narrow boots or injury to the foot, strain, blow, &c.

Rheumatism or gout may be a contributory cause, some degree of flat foot may also exist. When it occurs between the heads of the fourth and fifth metatarsals it is probably due to pressure on the branches of the external plantar nerves which pass through here. In the case of the disorder affecting the second and third, and third and fourth bones, it is believed to be due to weakening of the transverse arch of the foot, and if tight boots continue to be worn, friction is caused between the heads of the bones, with pressure on the nerves (Tubby). It may cause great disability in walking or standing; it is difficult to cure, and may require operative treatment, which is frequently followed by excellent results. Such an operation has no mortality beyond that of the anæsthetic.

MINERS' ELBOW. (*See* **Bursa. Beat Elbow.**)

MOSQUITO BITE.—Mosquitos are small, gnat-like insects of the venomous and blood-sucking kind. A species of the genus, Anopheles, transmits by its bite malarial fever; the Stegomyia conveys yellow fever, and Anopheles and Culex, filaria. (*See* **Chyluria. Elephantiasis. Malaria.**)

MUSCLE.—The compound mass of flesh which, by its contraction, causes movement in the body. Muscles are of two varieties—the striated or striped, which includes the heart, and all those in which the movements are voluntary; the unstriated, or smooth, which includes all involuntary muscles (except the heart), such as those of the intestines, bladder, blood-vessels, &c. Muscles may be injured by blows, contusions, wounds, &c.

Inflammation of Muscle (myositis) may follow injury; it may be acute, and very painful and incapacitating.

If it assumes a chronic form, such as follows some spinal diseases, inflammation of bones, ulcers, chronic eczema, &c., the muscle may ultimately consist merely of a fibrous membrane.

Traumatic myositis ossificans may follow chronic irritation, inflammation, overwork, and sometimes follows very slight injuries. The muscles most affected are the deltoid (shoulder), pectoral (chest, drill bone), adductors of thigh (riders' bone), arm and leg muscles (gymnasts' and dancers' bone). The disease is characterised by the formation of irregular masses, nodules or plates of bone in the muscles. It may cause a great deal of incapacity. This disease may also arise without any relation to trauma.

Strain of muscle is a tear of the muscle: it may be very slight, or it may amount to almost a rupture. In the lesser forms healing may take place without ill results; in the severer form, where there is actual rupture, the muscle may require suturing. If this cannot be done or is not successful, a gap will remain between the torn ends which may in time become filled up with fibrous tissue; this will cause a certain amount of weakness, and if the abdominal muscles are affected may be followed by yielding of the scar tissue, and hernia will result.

Perfect regeneration of muscle may follow slight injuries, but in the more severe injuries it only takes place to a limited degree. The muscles most commonly ruptured are the biceps and brachialis anticus in the arm, the abdominal muscles, and those in the thigh and calf. Paralysis of muscle follows injuries or disease in nerves or nerve centres. (*See* **the various Nerves. Atrophy.**)

MUSCULO CUTANEOUS NERVE comes from the outer cord of the brachial plexus, perforates the coraco brachialis muscle, and goes to the outer side of the arm between the biceps and brachialis anticus muscles supplying these; a cutaneous branch passes along the radial border of forearm, and supplies the ball of thumb;

another branch supplies the skin of the lower third of the back of the forearm on the radial side. Injury is not common, and if it occurs weakness or paralysis in the three muscles mentioned will ensue, causing loss of power in flexion and supination of the forearm, and loss of sensation in the parts of its distribution.

MUSCULO - SPIRAL NERVE.—It comes from the posterior cord of the brachial plexus, winds between the outer and inner heads of the triceps muscle in the groove in the humerus, and comes to the outer side of the upper arm as far as the external condyle of the humerus, where it divides into radial and posterior interosseus nerves. The nerve may be injured in any part of its course ; it is specially liable to suffer injury in the axilla (*see* **Crutch Palsy**) (in this the triceps will most likely be involved), and also by fractures in the shaft of the humerus (q.v.) ; and by violent dragging or throwing efforts by causing contraction of the triceps muscle, and consequent pressure by it on the nerve (Gowers). Severe damage to the nerve will have as a result drop wrist (q.v.), and loss of power of extension of the arm ; there will also be loss of sensation on the back and outer side of forearm and hand if the nerve is severed above its external cutaneous branch.

If the injury is not too severe, and it can be sutured easily, or if the nerve can be released from the callus or scar tissue which grasps it, recovery may be expected in twelve months (Sherren). The nerve is affected in lead poisoning (q.v.), and also in progressive muscular atrophy (q.v.). (*See* **Atrophy. Dropped Wrist.**)

MYELITIS.—Inflammation of the spinal cord. It may be of toxic, infectious, traumatic or compression origin ; it may be acute or chronic in its course ; the traumatism may be falls on the back and injuries of all kinds involving the cord, muscular strains. In the acute form the disease begins rapidly, and reaches its height in a few days to a few weeks; the symptoms are weakness of the limbs, anæsthesia and paralysis, retention of urine, or incontinence of fæces and urine; the temperature may be high, and bedsores develop. In some cases a certain amount of recovery may take place in about eighteen months. (*See* **Neuritis.**)

The chronic form usually follows the acute, and is really the later stage of it.

Compression Myelitis is a chronic myelitis due to pressure on the cord. This may follow fractures, dislocations and diseases of the vertebral column, the displaced or projecting parts causing compression. Syphilis, tuberculosis and tumours may also cause similar symptoms. The special signs and symptoms will vary according to the part of the cord affected. The disease is frequently fatal in from one to two years.

NAIL.—Direct injuries to the nails of the hand or foot are usually not very severe, nor do they cause any great amount of incapacity if uncomplicated. Injury to nerves, causing atrophy or trophic disturbance of the nail, will generally cause incapacity in proportion to the extent of the nerve damage.

If a nail is torn off, the nail bed may be tender and painful for a time, and in the case of the toes the wearing of a boot may cause much pain and discomfort, and some incapacity for work for a little time. (*See* **Paronychia.**)

NECK.—Injuries to the neck may occur as wounds to the soft parts—burns, scalds, &c.—or there may be associated damage to the cervical vertebræ, fractures of the jaws, injuries to the hyoid bone or thyroid cartilage, fractures and dislocations of the clavicle. Injuries to vessels and nerves may be most serious in their consequences.

For injuries and diseases of the vertebræ, *see* **Spine.**

Torticollis (Wry Neck, Caput Obstipum).—A condition in which the head is obliquely placed, the chin being rotated to the opposite side by a contraction or contracture of the muscles on one side. It may be fixed or intermittent (spasmodic).

The spasmodic form may be of hysterical origin; it may follow typhoid fever or infectious diseases, or it may be a result of chronic lead poisoning.

The fixed form may follow inflammatory disease in the muscles, or be the result of a burn or scald, and subsequent contracture of scar tissue; it may be of congenital origin. The condition is difficult of cure. (*See* **Spinal Accessory Nerve.**)

NECROSIS.—Death of a tissue *en masse.* The word is most frequently used in regard to bone. It may be limited in extent, or involve the whole shaft or body of a bone. It may follow injury, inflammation, or be a result of mercurial or phosphorous poisoning, syphilis or tuberculosis. When the necrosed bone is fully separated from the living, healthy portion, and ready for removal, it is called a **sequestrum.** The sequestrum usually produces a considerable amount of inflammatory irritation in the healthy bone, which causes the latter to throw out more or less new bone, which acts as a sheath or covering for the dead bone, and is called the **involucrum.** This may so completely wrap up the dead portion as to necessitate its being cut open for removal.

Zenker's Necrosis (coagulation necrosis) is a waxy or hyaline necrosis which occurs in muscles after forced contractions, as in tetanus; it also occurs in fevers, sepsis, &c. As a result of this, softening, hæmorrhages occur which may at times be large, and hæmatomata of considerable size form.

Quiet Necrosis of Paget (osteochondritis diseccans of König).—A peculiar, not well understood inflammatory condition which occurs in the articular ends of bones, and may cause loose bodies in a joint. (*See* **Joint. Arthritis.**)

It may follow traumatism, or may originate spontaneously.

Fat necrosis may follow injuries to the pancreas (q.v.).

NEPHRITIS.—Inflammation of the kidney. (*See* **Kidney. Bright's Disease.**)

NEURALGIA.—Pain in a nerve. It is usually of a darting or stabbing character. It is intermittent, and there are points on the course of the nerve where branches are given off which are unusually tender to touch.

If the pain is great and persistent it may cause total incapacity. The pain may set in at once, or, as is more usual, not for several days after the injury. In fractures, lacerated or septic wounds, this interval may be longer, or the severe symptoms may not develop until the nerve is gripped by scar tissue or callus, and this may be weeks or months after the original trauma. Neuralgia of the supra-orbital and great occipital nerves may follow injuries to the head. Injuries to the shoulder may involve damage to and subsequent neuralgia of the brachial plexus (q.v.).

Contusions of the chest and ribs, with or without fracture, and also injuries to the spine, may set up neuralgia of the intercostal nerves. Herpes zoster (shingles) is a painful skin affection, marked by the development of vesicles; it may follow injury to the intercostal nerves.

Meralgia.—Bernhardt's disease. Pain in the thigh during standing or walking, distributed over the course of the external cutaneous nerve of the lumbar plexus. This nerve comes from the 2nd and 3rd lumbar, perforates the middle of the outer border of psoas muscle, and enters the thigh below the anterior superior spine of ilium; supplies the outer part of anterior surface of thigh, as far as the middle. Meralgia is of traumatic origin once in about five times (Sievert, Sand). It may occur from the pressure of an ill-fitting truss, or from over-reaching or straining (Sherren). It may cause incapacity for walking. Resection of the damaged portion and union of the ends may completely cure the disease. (*See* **Sciatica.**)

Causalgia.—A burning pain affecting the distribution of an injured nerve; it is probably a neuritis (q.v.). The pain may be so severe as to seriously affect the general health; the injuries are not usually extensive, at least not sufficient to sever the nerve but to involve it in scar tissue. The symptoms set in after a latent period of several weeks following the trauma. Good results will often ensue from operation in from a few months to a year, according to the amount of damage done, or whether resection of the affected portion of nerve and restoration of continuity in the severed ends has been successful.

NEURASTHENIA.—Nervous exhaustion, nervous prostration. A condition in which there is a considerable amount of exhaustion and depression of the mental and physical activities. The symptoms are loss of will power, inability to concentrate attention, early exhaustion during mental and physical effort. In these cases fatigue after efforts which call forth little exertion is slowly recovered from; there is usually insomnia, loss of memory, palpitation, backache, loss of appetite, impaired nutrition. The condition may follow severe or exhausting illness. Trauma which involves the head or back is a frequent cause. Fright is often a precursor. Excessive mental and physical work, if long continued, may develop the disorder, and if such subjects suffer injury the neurasthenic symptoms appear rapidly.

Trauma of the head and spine is often inflicted in railway collisions, and the neurasthenia which follows is commonly spoken of as railway spine, railway brain. In these cases some actual damage is not infrequently found, but traumatic neurasthenia may occur without there being any evidence of injury to structure.

As to the pathology of the condition little is known; it may be intimately associated with the early stages of the various organic diseases of the brain and spinal cord, and it is sometimes a matter of great difficulty to determine absolutely, in a given case, how much belongs to neurasthenia and how much to organic disease. Careful observations, taken at intervals during a period of two or three months, will enable an observer who has knowledge and experience of cases of the type to form an opinion which will perhaps include no very glaring inaccuracies. If the subject can be kept under continued observation in an institution, then the opinion will be based on a greater number of observed and recorded facts, and consequently so much the more valuable.

That fright is a powerful contributory agent in producing the disorder seems to be established to some extent by the fact that persons who are asleep or drunk during the occurrence of an accident are less liable to develop neurasthenia. Those cases in which there has been damage to a greater or lesser extent, as evidenced by loss of consciousness, severe contusions, marked concussion, fractures, dislocations, &c., will offer no unusual difficulty in understanding that neurasthenia may readily result, and be a serious and even permanent affection.

On the other hand, not so easy to understand are those cases which immediately after the accident appear to be well, and show no sign of any physical injury or nerve trouble, but who, after an interval of several days to several weeks (indeed, the patients may have worked hard at rescue work and been quite forgetful of themselves), show distinct signs and symptoms of a neurosis. This latent period, be it long or short, between the injury and the development of the symptoms is an incident which is calculated to create a certain amount of suspicion as to the good faith of the patient. Still, this period is well recognised. The subjects may to all appearances be healthy, and express themselves as having escaped with little damage, yet they will soon after exhibit all the characteristics of the disorder ; they may vomit or have outbursts of hysterical weeping, be sleepless, and later become typical neurasthenics. Possibly the explanation of this latent period may be found in the theory that while the accident has produced a profound depression of the nervous forces, a certain amount of automatic control still remains, but that this is dispersed later by a vivid memory picture of the accident itself, and a morbid dwelling on the more terrible personal consequences which might have happened.

Injuries which occur without the appalling associations of a railway accident may also produce varying degrees of shock, which may pass into neurasthenia.

Such injuries must necessarily have been severe, and produce something in the nature of profound shock; lesser injuries may be exciting influences if they occur under circumstances of great mental stress, or in subjects whose nervous system is, by reason of their occupation, continuously strained to breaking-point. A type of neurasthenia in which the psychical symptoms predominate is described and named by Janet, of Paris, as **psychasthenia.** It is a much more serious disorder than simple neurasthenia, and is recognised by obsessions, imperious acts, stigmata. The obsessions are irresistible, and dominate the personality; they may be of the nature of criminal acts, kleptomania, dipsomania; hallucinations are usually absent. The imperious acts are manias of repetition, useless movements, unrest, and the phobias: claustrophobia (dread of closed places), aichmophobia (dread of sharp instruments), mysophobia (dread of infection), rupophobia (dread of dirt), batophobia (dread of a great height), siderodromophobia (dread of railroads), panophobia (dread of everything).

The stigmata are: the subjects are timid, irresolute, hesitating, mental effort of the slightest intensity is often impossible, the actions are slow and awkward, and finally all initiative is abolished. The patients frequently become addicted to morphia or alcohol. The whole syndrome is closely allied to insanity (q.v.).

Bailey thinks that psychasthenia is rarely, if ever, excited by physical injury, and Purves Stewart believes it to be the culmination of a congenital condition developing without apparent cause.

The prognosis in regard to simple neurasthenia is on the whole good, but the recovery is frequently a matter of considerable time; in any case, thorough mental and physical rest is an important element in the cure. The psychasthenic will probably require more careful attention and segregation, but he is not incurable, at any rate in the milder forms and earlier stages. This disease in its pronounced form does not seem to be very common after injury.

In endeavouring to form a prognosis it is well to take into careful consideration the circumstances under which the accident or injury has happened: apart from distinct lesions of brain or spinal cord structure, the psychic effect produced is often of greater importance than the amount of trauma in persons predisposed to neuroses, and the results may be much more lasting than in normal individuals.

It is of much importance that the medical examiner should be on his guard as to malingering; still, it is quite certain that every neurasthenic is not a malingerer.

In cases of neurasthenia of the simple type, uncomplicated with any organic lesion, after a period of thorough rest the question as to what amount of work the individual can undertake frequently arises. The enfeeblement of the will (aboulia) and the despondency of the subject are often the obstacles which stand in the way of a return to the normal amount of physical exercise associated with the occupation of the individual, in short his return to work. If we recognise that the aboulia is really an important component of the whole neurasthenic syndrome, it will follow that the treatment of this is part of the treatment of the case.

While employers can hardly find, under the name of light employment, the system of graduated physical exercises suitable to this class of neurasthenic, and necessary for recovery, the patient is often totally unable to do the kind of work at the disposal of the employer to offer. Compensation is paid, and the subject returns to his home, drifts from bad to worse, and runs a serious risk of becoming a useless member of society, and a bad example to his fellows. There can be no doubt that the provision of institutions where such cases could be treated by hydropathy, massage, exercises, &c., and rendered capable of undertaking their usual occupation, or some other suitable employment, would be a considerable relief to the employer, and of lasting benefit to the workman. The problem will have to be resolved at an early date, as it is to the interests of our social fabric that the humblest hewer of wood and drawer of water should have ready access to the most modern and approved scientific methods for the restoration of health.

At present it must be said that it is very difficult for neurasthenics to make a rapid recovery. They do not do well in their homes, few hospitals want them, most convalescent homes are unsuitable, and hydropathics are costly. (*See* **Back. Backache. Head Injuries. Hospital. Hysteria. Malingering.**)

Traumatic Neuroses.—A general term which may include in the same subject hysteria, neurasthenia, and possibly some organic disease. Most of the cases will show signs of a predomination of one or other of these conditions, and so generally it will be classed under that particular head.

NEURITIS.—Inflammation of a nerve. The symptoms are tenderness over the course of the nerve, pain, anæsthesia, paralysis, atrophy of muscle. It may follow injury; zinc, mercury, arsenic, copper, phosphorous, carbonic oxide, and lead poisoning; alcoholism, diabetes. It may be spontaneous, as in the ulnar nerve; this latter condition is often incurable. It may be a sequence of repeated pressure, extension of inflammation, infectious diseases, exposure to cold, syphilis.

Alcoholic neuritis is a multiple neuritis. This is distinguished by the history of alcoholism, acute onset, paralysis of arms and legs coming on slowly, foot drop, wrist drop (q.v.), sharp pains, early loss of faradic reaction, changes in response to galvanic current, loss of knee-jerks, and by the symmetry of its distribution.

A migrating or ascending neuritis may follow an operative wound or other injury to a nerve. If it occurs there will be pain, anæsthesia, paresis, paralysis. It is a chronic affection, and does not get well readily. A **myelitis** (q.v.), or **inflammation of the spinal cord,** may be secondary to neuritis. The changes in this case which affect the delicate nerve tissue are tumefaction and destruction of the axones, degeneration of ganglion cells and posterior nerve roots (Hektoen and Riesman).

NEUROMA.—A tumour growing on a nerve. It may follow a wound of a nerve, and it is found in stumps after amputations. It may cause a great deal of pain. It may be a new growth, or be largely made up of nerve substance. Operative removal of the tumour, or section of the nerve, may effect a rapid cure.

NICKEL CARBONYL POISONING ($NiCO_4$).—A volatile liquid, formed in the course of the manufacture of nickel from the ore. Some authorities think that the poisonous effects produced are due to the carbon monoxide, but others accept the view of H. W. Armit that the symptoms are due to the nickel. The inhalation of the gas is the means by which the poison enters the system.

The symptoms may occur at once: they are headache, nausea, vomiting, pain in the chest, difficulty in breathing; these may be slight at first, but twelve to eighteen hours later they show an increase in severity; the respirations become more frequent until the fifth or sixth day, when they diminish, and recovery begins to set in. The disease is very serious, and death may occur. The *post-*

mortem findings are hæmorrhage and œdema in the lungs and hæmorrhages into the brain substance. Scheduled.

NITROUS FUMES.—The fumes are given off in the manufacture of various chemicals and explosives, such as nitro-glycerine, celluloid, &c. One rapid effect of the fumes, when inhaled, is to produce irritation of the vocal chords, and possibly suffocation. On the other hand, a man may continue to work for some time after the inhalation and later, twenty-four to thirty-six hours, die from acute inflammation of the lungs. Clinically the disease is difficult to distinguish from acute double pneumonia. The *post-mortem* appearance is inflammation, exudation into the bronchial tubes and air vesicles, and the lungs as a whole are completely filled with fluid. Scheduled.

NOSE.—Fractures of the bones may result in deformity. In many cases this can be avoided if treatment is sought early. If the nasal passages become blocked up so as to compel the subject to breathe through the mouth, throat and lung troubles and their sequelæ may develop later, and thus cause more or less incapacity for work. (*See* **First Nerve**.)

OBSTRUCTION (Stoppage. Intestinal Obstruction).—A hindrance to the passage of fæces or flatus through the bowel. The chief symptoms are complete obstruction to the passage of intestinal contents; vomiting, first of stomach contents, then bile, then fæcal matter; pain, this is not always marked and often the diagnosis must be made without it; distension. The disease may be acute or chronic. Such a condition may arise without any relation to trauma, as in the development of cancer, or growths in the bowel, or by the pressure of tumours developing in other abdominal organs. (For the relation of cancer to trauma, *see* **Cancer.**) It also occurs by the plugging of the intestine from within.

Trauma may determine an intussusception or a volvulus occasionally, formation and the strangulation of a hernia frequently; it may cause peritonitis followed by the formation of bands or adhesions between loops of gut; these may be followed by kinks or occlusions producing obstruction which may be more or less complete. A very dangerous and often fatal disorder. (*See* **Bowel. Peritonitis. Intussusception. Volvulus.**)

ŒDEMA.—A swelling due to the effusion of watery fluid into the subcutaneous tissues.

Œdema of the hands following injury has been described by Secretan and Vulliet. Its nature has been very much discussed, some holding that it is due to provocation by tight bands placed round the arms; by hammering the back of the hand with a round hard body, a bottle; others that it is a genuine affection. (Secretan, *Rev. Med. Suisse romand*, Juillet, 1901. Patry, *Rev. Med. Suisse romand*, Mars, 1903.)

Œdema of the face, limbs, &c., may be a symptom of diseases of the heart or kidneys, or localised inflammatory conditions. (*See also* **Malignant Œdema.**)

OMENTA.—Folds of peritoneum (q.v.) going from the stomach to adjacent organs.

The Lesser or Gastro-Hepatic Omentum passes from the transverse fissure of the liver to the lesser curvature of stomach and first part of duodenum.

The Great or Gastro-Colic Omentum passes down from the great curvature of the stomach enclosing the transverse colon.

The Gastro-Splenic Omentum is a fold of peritoneum connecting the spleen with the stomach.

Injuries to the omentum may occur by penetrating wounds to the abdomen. Subcutaneous ruptures, that is, rupture without opening the abdominal cavity, may follow blows or falls upon the abdomen, kicks, contusions, crushes.

Death may follow from hæmorrhage if large vessels in the omentum are torn. The nutrition of the stomach and intestines may be endangered when large portions of the omentum are destroyed. Early operation may save life.

Torsion of the great omentum may follow injury (Giraudeau, *Thèse*, Paris, 1902) ; this, however, appears to be more frequently found in connection with hernia. In four of the recorded cases, it was thought that violent and sudden efforts had brought on the condition (Kelly and Noble).

Vignard and Giraudeau (*Arch. Provinc. de Chirurg.*, 1903, XII, 206) speak of three varieties : torsion at a single point ; at two different points ; complex. The diagnosis is not easy, it may be confounded with appendicitis ; pain is a constant symptom, vomiting, constipation and distention are also present. Complete recovery will be the rule if there can be an early diagnosis and a prompt operation. For a full account of omental torsion, see Wiener, *Annals of Surgery*, November, 1900.

OPERATIONS.—The question as to whether an injured person receiving or claiming compensation should be compelled to undergo an operation, or should submit to an operation as a condition of his being compensated, is one which has been frequently before the various courts. It appears that judges, up to very recently, have felt themselves unable to undertake the responsibility of enforcing either directly or indirectly such a restriction, the reason for this being (apart from matters of law), no doubt, largely due to the possible fatal termination of an operation, a sad event which may follow even slight operative procedures. It appears to be probable that the anæsthetic is the part of the operation which patients dread most ; but if one considers the thousands of cases in which chloroform or ether are administered without the least appearance of dangerous symptoms, there is ample justification for recommending that a patient should accept the slight hazard of the anæsthetic sleep ; in fact, most of the brilliant results of present-day operations would be totally unattainable without it. The newer methods of anæsthesia, notably that produced by injections of certain drugs into the part to be operated on or the more extensive analgesia resulting from injections of novocain, &c., into the spinal canal at the site of the lumbar vertebræ (the cisterna caudalis of Canny Ryall), are giving such splendid results in entire absence from pain that many a severe operation on the lower half of the body can be carried out while the patient is all the time fully conscious, but insensitive to the surgeon's wounds.

The remarkable developments and achievements of modern surgery, and the diminishing mortality of serious and extensive operations in expert hands, are now well known to the judiciary and the public, so that when opinions are advanced in courts by medical men as to the mortality of operations they can frequently be supported by statistical records.

These may show such a small mortality that they tend to allay the very natural shrinking from the ordeal of a surgical procedure, or, on the other hand, they may show that certain operative measures are accompanied by unusual risks to life. In the case of an insignificant operative mortality, the judicial tribunal may feel fully warranted in enjoining an operation, while under circumstances in which there is distinct risk the submission or refusal would be properly left to the individual, and he would have a free choice.

The matter of the suitability of each particular case for operation would still be open for discussion, but it would offer no very great difficulty in coming to a just conclusion.

Passing from the subject of the mortality of operations to the rather more involved one of the value of operations, we know that a very large number of operations are followed by complete relief and restoration to good health, but it would be a very bold undertaking to offer anything in the way of a guarantee that such a result would invariably follow. Still, there are many conditions in which the medical attendant feels himself quite justified in urging the patient to take a risk, having regard to the successful results which experience in similar cases has shown. In the case of an injured workman, if the operation fails to relieve, it may be accepted that the injured person has endeavoured, so far as lies in his power, to render himself capable of undertaking some occupation in order to maintain himself.

Some operations, such as the surgical treatment of hernia, breaking down of adhesions in joints, &c., have for their object the restoration of full physical capacity; while others, amputations, excisions, &c., are in their character more or less destructive, and can only partially restore working capacity. It is probable that patients themselves will be found more willing to submit to operations of the former class, in which there is a reasonable hope of return to full health, than to the latter, where, when the best is done, there still remains deformity, mutilation or lameness.

Another point in relation to this question of operation may arise, that is, to how many operations should a patient be submitted. It may be that more than one is required as a necessary part of the treatment, and in advising second or third operations it appears that precisely the same relation should obtain as does in ordinary life. If the first has been severe and has not fully succeeded, the patient should be left quite free to choose as to whether or not he will submit to a further major operation. If the secondary operation is slight and carries with it very little increase of danger, beyond that of the anæsthetic, the patient ought to submit. Among procedures of this type may be mentioned repeated forced movements of stiff joints, removal of stitches, wires or staples used for joining ununited fractures and such-like conditions, which are considered so simple in their nature as to be barely in the minor operation class.

Recurrences may follow in a few weeks, months or even years the best planned and performed operative effort. In malignant diseases it is now considered that if a patient is free for three years after the extirpation of the disease a complete cure may be expected. Hernia may recur after the so-called radical cure, and is most frequently noticed in the first six months after the operation. It is probable that hernia recurs after less than five per cent. of operations for radical cure. The operation is now so satisfactory that this percentage is rapidly diminishing.

The inclusion of a certain form of cataract in the schedule of industrial diseases, with the provision that an operation must be undergone as a condition to be fulfilled in order to receive compensation for six months, is of great importance. I think that some like stipulation might well be introduced in regard to hernias which are small and recent, particularly in men who are otherwise healthy and vigorous, and to whom the operation offers a good prospect of return to full physical capacity for work.

OSTEITIS (Osteomyelitis).—Inflammation of bone. This may be in its nature a part of the regenerative process for the repair of fractures, or a concomitant of caries and necrosis for the purpose of filling up defects caused by these diseases, being thus a limited restorative action. It may be due to local irritations such as injuries, or the irritating agents may be carried by the blood, in which cases it may be excessive and widespread, causing destruction of the bony tissue. It may be infective or non-infective.

Acute Infective Osteomyelitis is usually the result of a hæmatogenous (derived from the blood) infection. It occurs in the young as an apparently primary disease of a dangerous type, or it may follow infectious diseases, such as scarlet fever, typhoid, measles, &c., and may also be a part of a septico-pyemic infection. The bacteria (staphylococci) may enter the blood from a minute wound and establish themselves in the bone. It is frequently impossible to locate the point of entrance ; the slight abrasion may have healed and become forgotten when the disease sets in suddenly and violently. The disease has also been produced experimentally in animals by injecting the micro-organisms into the blood, and then causing a subcutaneous injury to a bone. It has also occurred after experimental inoculation in young animals, but without the injury; in these cases it attacks the growing ends of the bones. In experiments on older animals the bacteria affect the internal organs and joints.

The disease may cause great destruction of bone (necrosis), and may result in blood poisoning and death, or it may assume a chronic suppurating course, and leave a number of discharging sinuses. So long as these sinuses remain open there is ever present the danger of a recurrence of acute serious symptoms; other bones may become affected and further destruction of tissue ensue. The chronic suppuration will sooner or later affect the health, and incurable amyloid disease (q.v.) of the liver and kidneys may develop. (*See* **Bone. Caries. Necrosis.**)

Injury to a bone may be the exciting cause of a **tuberculous osteitis,** that is, trauma may determine the localisation of bacilli which are already in the system. This disease may be followed by great destruction of bone and total incapacity. (*See* **Tuberculosis.**)

PACHYMENINGITIS.—Inflammation of the dura mater (the outer, thick membrane which covers the brain and spinal cord). The symptoms are those of meningitis (q.v.), but the dura mater may itself be the seat of thickening or hæmorrhages. The disease may follow injuries such as contusions or fractures of the skull or spine, tuberculous or syphilitic disease, or osteomyelitis. A chronic form of the disease may have as symptoms headache, vertigo, epilepsy of the Jacksonian type, paralysis, melancholia, dementia. (*See* **Brain. Head Injuries. Meninges. Spine.**)

PANARIS (Whitlow, Felon).—A septic inflammation of the finger which arises from injury caused by rents in the skin, permitting the entry of infection. It may remain confined to the epidermis, or penetrate to the tendons and bone, causing complete destruction of these, and consequent loss of the whole or part of a finger.

The infection may spread into the palm of the hand and up the arm. There is greater danger of this if the disease begins in the thumb or little finger, as the flexor tendon of the little finger frequently communicates with the common carpal synovial membrane, and the flexor of the thumb has also a long sheath which readily conducts infection up to the wrist. General blood poisoning may ensue, and prove fatal. In any case in which the infection invades the tendon or its sheath there is certain to be deformity and interference with function, and impairment of the usefulness of the finger or hand. These cases usually require early operation in order to check the spread of infection and destruction of tissues. (*See* **Fingers.**)

PANCREAS.—This is a gland about eight inches in length, situated in the abdomen opposite the first and second lumbar vertebræ. It is in close contact with the stomach, duodenum and spleen. The secretion of the pancreas, which is of great importance in digestion, passes into the duodenum through the pancreatic duct. Injuries to the abdomen may cause a hæmorrhage into the substance of the pancreas, a necrosis, or even a rupture.

The formation of a cyst may follow an injury, blow on the abdomen (Cushing), and rupture of these, if they are already formed, may readily be caused by a blow or an effort or strain. Injuries to this organ are very serious, and frequently cause death.

PARALYSIS.—A loss of motion or sensation in a limb.

Paresis.—Slight or partial loss of power.

Hemiplegia.—A paralysis of one half of the body.

Crossed Hemiplegia.—A paralysis of the extremity of one side, and paralysis of facial or eye muscles of the other side.

Paraplegia.—Paralysis of both lower limbs.

Monoplegia.—Paralysis of one extremity.

PARALYSIS AGITANS (Shaking Palsy).—A disease which is progressive in its course, and is marked by tremor and weakness of muscles, a peculiar involuntary tendency to increase speed in walking (festination), muscular contractions, sweating. The disease usually occurs between the ages of forty and sixty, and in persons who are previously healthy. Amongst the causes are fright (Gowers); shock, with or without associated physical damage; moderately severe injuries such as contusions, fractures, injuries to nerves, stabs; sometimes sprains, twists, anxiety, exposure to cold and wet, rheumatic and other fevers. It is common to find that in traumatic cases the symptoms begin in the injured part. The disease, when it arises without any relation to trauma, usually makes its first appearance in the hands. It is incurable. The signs and symptoms generally show themselves soon after the injury, but may be delayed as long as four years (Walz), or even longer, as in the case recorded by Bailey, in which the disease developed twenty years after a severe mutilation of the hand. In a case mentioned by Whitla the disease appeared soon after a severe wound of the wrist.

PARONYCHIA.—A septic inflammation of a usually mild form, which may follow injury about a nail; an abscess may form, and the nail be cast off. (*See* **Nail.**)

PAROTID GLAND.—The largest of the salivary glands. It is situated one on each side of the face, between the ear and mastoid process of the skull behind, and the portion of the jaw above the angle in front.

The gland may be injured by blows or wounds which, unless they are deep, and thus injure the important nerves or vessels which traverse the gland, usually get well quickly. The duct (Stenson's duct), which is about two inches long and opens into the mouth, may be injured, and a permanent fistula result. The operative treatment of such a fistula is frequently successful, but often several operations are required; they can hardly be described as unduly dangerous.

PELVIS.—The bony basin which is formed by the innominate or haunch bones and the sacrum and coccyx. It is situated at the end of the spinal column, and has the lower limbs attached. It contains important organs, such as the terminations of the ureters, bladder, urethra, rectum, with uterus and vagina in the female, as well as parts of large and small bowel, vessels and nerves.

Injuries to the pelvis and its contents may follow falls on the buttocks or feet; crushes, as in buffer accidents or under heavy bodies; falls from a height; being run over, &c. These are usually very severe, and may cause fracture of the bones and rupture of the bladder, urethra, or other organs. The permanence of the injury is usually dependent on the situation and extent of the fracture and the nature of the complications; many of these injuries are rapidly fatal.

Simple fractures of the iliac, or upper portion of the haunch bone, may not be serious, and may cause very little incapacity later. Dislocations of the pelvic bones are rare injuries. They may be capable of being reduced and kept in position; if not, they will cause total incapacity for any but the lightest physical labour.

Fractures of the sacrum are usually seen in connection with other fractures of the pelvis. In this the nerves of the lower end of the spinal cord are very liable to damage, with consequential paralysis of bladder and rectum.

Dislocations of the sacrum may occasionally occur, and cause difficulty in walking and great pain; and as complete restitution is hardly possible in most of these injuries, there will be greatly diminished capacity for work. (*See* **Bladder.**)

PERINEUM.—The area between the anus and genital organs. It is occupied by the urethra in the male and the vagina in the female. The urethra may be ruptured in the male by blows or kicks on the perineum, or by falling astride. This is a very serious injury, and may be followed by extravasation of urine, requiring immediate operation to save life. If any length of the urethra is destroyed there may be a permanent perineal urinary fistula, or there may be, as a result, an intractable stricture.

A case of alleged rupture of the female perineum by a fall on the buttocks came under my notice. An examination showed a healed tear, with the formation of a considerable amount of scar tissue. The woman had borne several children, and the opinion I formed was that the ruptured perineum was due to causes associated with parturition, and not due to the fall on a flat surface. It would be difficult to understand how such an accident could rupture the perineum. If the subject fell astride a joist or beam, or on the end of a stake, such a condition might readily ensue, and would be followed by free hæmorrhage or other complications of a probably serious nature.

PERIOSTEUM.—The tough, strong, fibrous membrane which closely surrounds a bone. This is in two layers, an external or fibrous layer, and an internal one which consists of cubical cells called osteoblasts, or bone-forming cells.

Periostitis.—An inflammation arising in the periosteum, or spreading from the bone to the periosteum. The condition may arise from continued irritation and injury, or it may be a normal process for the repair of bone. It may be the result of infection carried by the blood, tuberculosis, syphilis, infected wounds, or be associated with osteomyelitis (q.v.).

A form of painful periostitis is said to occur in mother-of-pearl workers who breathe the dust.

The simple, non-suppurative form of periostitis usually gets well rapidly, without leaving any very great disability. The other forms arising from tubercle, syphilis, infection, &c., may cause caries or necrosis, and consequent destruction of bone. (*See* **Bone.**)

PERITONEUM.—The serous, lining membrane of the abdominal cavity. The parietal peritoneum is that which lines the walls of the cavity, and the visceral peritoneum is that which covers the organs.

There are various folds or processes of this membrane which have different names, such as omentum, mesentery (q.v.).

Peritonitis.—Inflammation of the peritoneum. This condition is often of infective origin : that is, the infecting bacteria may come from their normal habitat in the stomach or intestine, or they may be carried by the blood stream, as in tuberculous peritonitis. It may be localised or diffuse, plastic, adhesive or fibrous, septic, tuberculous ; these may have traumatism as an exciting cause. Injuries of the abdomen may set up an inflammation of the parietal peritoneum, or, falling short of causing a rupture of visceral peritoneum or viscera, may cause a plastic or fibrinous peritonitis which results in adhesions and intestinal obstruction, or the adhesions may later cause severe dragging pains when the viscera are performing their proper peristaltic movements, and thus be a cause of total incapacity for work ; they may be relieved by an abdominal operation. This fibrinous form may actually seal up a rent in the gut, preventing the extravasation of its contents, and so recovery may ensue. Such a curative effort on the part of nature has been known to occur after perforating gunshot wounds of the stomach and intestine, caused by the modern, high-velocity rifle. A similar effort at cure may occasionally follow the perforation of a gastric, duodenal or other ulcer.

These fortunate and rare results are the more likely to follow if the viscera are empty. This occlusion effect of fibrinous peritonitis, while it may be ultimately successful, as indicated, may fail even after the lapse of days through the fibrinous cement becoming septic by contact with the intestinal contents, or by movements of the gut breaking open the sealed rent. Such a catastrophe allows the pouring out of septic, intestinal matter, and as a consequence there occurs suppurative peritonitis, and probably a fatal result. A case quoted by Thoinot is apropos : A man of 30 received a kick in the abdomen ; he resumed his work on the 10th day, he stayed away from work on the 52nd and 72nd days, was obliged to enter hospital on the 77th day, and died 7 days later, 84 days after the injury. The *post-mortem* revealed a perforation of the intestine, and several gangrenous patches on the mucous membrane of the gut. I have knowledge of a similar case, but of shorter duration.

Septic peritonitis is an extremely dangerous disorder, particularly if it is diffuse in the abdominal cavity. It usually follows rupture or wounds of the gut, or penetrating abdominal wounds, strangulated hernia, intestinal obstruction, appendicitis, &c. (*See* **Bowel. Stomach.**)

Tuberculous Peritonitis.—Infection of the peritoneum with tubercle bacilli. It occurs as an acute disorder, and may be a part of general tuberculosis : it may be chronic in its course, and be associated with a sero-fibrinous exudation of fluid ; part of this may become organised, and form dense adhesions.

Injury or effort involving a tuberculous focus in any part of the body may cause dissemination of the bacilli, and thus set up a general tuberculosis. If the bacilli are present in the body, and there occurs an injury to the abdomen, it may determine the localisation of them in the peritoneum, and thus cause a tuberculous peritonitis, which may produce permanent invalidity or destroy life. This disease may, of course, arise quite apart from trauma, by extension from the lungs, pleura, intestinal glands or the abdominal organs, such as kidneys and bladder, or the organs of generation.

PERONEAL or EXTERNAL POPLITEAL NERVE is a nerve of motion and sensation. It is one of the divisions of the great sciatic nerve. It passes in the popliteal space (space in the bend of the knee), inside the biceps, over the outer head of the gastrocnemius muscles to an inch below head of fibula, where it divides into anterior tibial and musculo-cutaneous nerves. It supplies the knee-joint, extensors of foot, back and outer side of upper third of the leg.

Injuries to the nerve readily occur on account of its somewhat exposed position, below the head of the fibula, on the outside of and just below the knee. It may be cut in the sweeping movements of the scythe in mowing, by contusions, fractures of the upper end of fibula, by pressure on it, caused by prolonged squatting or kneeling (Zenker's Paralysis), by being caught in callus or scar tissue; it may be injured by sudden strain or exertion, as in jumping, or making a false step.

The symptoms are weakness of the leg and foot; a condition like club foot (or talipes equino varus), with contracture of the tendo achilles, may ensue. Operative suture, or release of the nerve from the grasp of callus or scar tissue, is the only chance of curing the condition if the nerve is torn or caught. The after-treatment is of the greatest importance, and recovery of power will take place in a good many cases: this may be expected to be complete in three years (Sherren).

PHLEBITIS.—Inflammation of a vein. The condition is one of inflammatory infiltration of the coats of a vein, with the formation of a clot of coagulated blood which obstructs the flow of the blood stream.

The vein becomes hard and painful, and the limb may become swollen and congested, even gangrenous in extreme cases; a portion of the clot may become dislodged and pass into the circulation, causing embolism, and perhaps sudden death; if it is septic, embolic abscesses may form in the lungs, brain and other organs, with general blood poisoning and possibly a fatal issue.

Phlebitis of the deeper veins, and subsequent thrombosis, may follow fractures from damage to the veins at the time of the injury; it may produce and maintain a great deal of the swelling which occurs in limbs after fracture; this is very persistent, and sometimes causes a considerable degree of incapacity. The deeper veins of the leg may be injured by a wrench or twist, giving rise to a sudden, sharp pain, similar to that produced by rupture of the plantaris muscle. There will be effusion of blood and incapacity for six or eight weeks. (*See* **Tendon.**)

Inflammation may occur in varicose veins after injury, and cause pain or result in a very chronic ulcer difficult to heal. (*See* **Embolism. Varicose Veins.**)

PHOSPHORUS POISONING.—Phosphorus is used in the manufacture of matches. A dose of 0.1 gm. (1.54 gr.) of phosphorus is poisonous, and causes vomiting and pain; death may result from heart failure. The early symptoms may subside, and later there may develop jaundice, enlarged liver, fever, vomiting, delirium, coma, death.

The *post-mortem* appearances of the liver in phosphorus poisoning resemble those of the disease known as acute yellow atrophy of the liver, but they can be distinguished by microscopic examination. The most important lesion of chronic phosphorus poisoning is necrosis of the bones of the jaws; this is caused by the action of the vapour produced during the process of the manufacture of matches, and occurs in those workers who dip the matches in the bath. It generally begins at a decayed tooth; suppuration follows, extending to the bone, and deep abscesses may form in the neck. The condition is called "fossy jaw." (*See* **Jaw. Yellow Atrophy.**) Scheduled.

PHTHISIS (Pulmonary Consumption, Pulmonary Tuberculosis).—A disease due to the presence of the bacillus tuberculosis in the lungs. It is characterised by cough, expectoration which is frequently blood-stained, wasting, fever, night sweats and diarrhœa. The bacillus finds its way into the system by the circulation or by the inspired air, or it may enter by the ingestion of infected food.

The disease may spread rapidly, or it may be resisted or retarded by the vital action of healthy, vigorous tissues: this vital action may cause the focus to be encapsuled and calcified, and so remain quiescent for years; these foci may retain a certain amount of virulence, and if the barrier which limits their progress is removed, by injury or other cause, they may again be a source of general infection.

The disease may arise directly as a result of an injury to the chest, or it may ensue indirectly by infection during the course of recovery from severe trauma involving any part of the body. A workman who is confined to an ill-ventilated, insanitary or infected house, by reason of illness or accident, is not placed in the most favourable circumstances for resisting an invasion of tubercle bacilli.

Amongst the direct causes may also be included the dispersion of the disease, by injury, from a focus in a bone or joint or other structure, and its subsequent location in the lung. In a patient who is already the subject of the disease in an inactive or latent form there will be no difficulty in believing that an injury involving the chest can easily aggravate and expedite the progress of the disorder, and so materially lessen the span of life.

But in accepting phthisis as the immediate or delayed result of a chest injury, involving lungs previously absolutely healthy, there are greater difficulties to face, and it is certainly not common to find evidence strong enough to place the relationship beyond any doubt; yet there are cases in which the relationship must be admitted, or at least cannot be refuted. In these we may include such conditions as hæmoptysis following an extraordinarily great effort, or contusions of the chest involving the lung, the sequence being hæmoptysis, phthisis.

In answer to such a proposition, it may be properly argued that in these circumstances we had to deal with an incipient, latent, or quiescent tuberculosis, rendered evident by the trauma, and that even the most thorough examination of the lungs before the injury might not have detected a small, inactive focus of disease. In many cases it will be hardly possible to distinguish between a phthisis caused by injury to the lung and an unmasked phthisis ; the presumption will usually be in favour of the latter. We know that injury cannot create tubercle bacilli. The point of entry may very rarely be an open wound carrying the bacilli directly into the lung, or a tear of lung tissue may occur, and the rent is invaded by the bacilli which are frequently found in the bronchial tubes of healthy individuals, so that there will be infection either from the patient himself or from outside.

It will, of course, be quite plain that the sooner the signs and symptoms of the disease appear after the traumatism the greater is the probability of there being an authentic connection between effect and cause. On the other hand, if we found the disease developing or developed after a delay of several months, it would be necessary, in order to accept the relationship between it and injury, for there to be a continuity of signs and symptoms which would show the course and progress of the lung affection as beginning in trauma and ending in phthisis. In such cases as these there would probably be found a history of a traumatic pneumonia which had not resolved well, or some evidence of marked damage to the lung or pleura, or possibly to the chest walls.

A point which will also require attention is whether, in a given case of phthisis alleged to be consequential on injury, we are dealing with an old-standing disease of non-traumatic origin ; that is, there is an attempt at substitution (q.v.). It is indisputable that a workman, the subject of definite phthisis, will not be able to do much hard work. An examination of the chest will usually reveal the stage of the disease ; the presence of cavities in the lungs, the fever, the hectic and the sweats, will, if present, all go to show a disorder of some standing.

The question which would remain to be decided in these well-defined cases would be that of aggravation or acceleration. It is almost certain that a contusion or an effort involving a lung in an advanced stage of tuberculosis would provoke a violent attack of hæmoptysis or heart failure, and consequent rapid death. (*See* **Hæmoptysis. Lungs.**)

Phthisis and Pulmonary Fibrosis (Miners' Phthisis, Stone Masons' Phthisis, Grinders' Rot, Potters' Rot).—This is a disease specific to the trades of grinders, potters, masons, ganister and tin miners. Coal miners appear to be particularly immune from attack. It is of gradual development, and is due to the inhalation of dust particles, and the formation of foci of chronic inflammation. These foci coalesce, and large areas of the lungs are involved in a slowly-contracting mass of fibrous tissue, which is usually invaded by tubercle bacilli. The disease may last ten or fifteen years or more, and yet it may not incapacitate during that time. If a healthy man continues in an employment where large quantities of irritating dust are produced, the disorder may eventually set in and shorten the period of his full working capacity, and it will also most probably shorten life. (*See* **Anthracosis. Dust.**)

The symptoms are cough, expectoration containing particles of grit, shortness of breath, some little wasting, difficult inspiration, and subdued respiratory murmurs. (*See* **Dust.**)

PITCH.—A bituminous substance of a tarry nature. The dust given off during the grinding of pitch, or the vapours developed during the boiling of it, may produce eruptions on the skin, cancer, &c.; splashes of hot pitch in the eye are very dangerous to sight. (*See* **Cancer. Epithelioma.**)

PLAGUE.—Bubonic or Oriental Plague. A dangerous epidemic disease caused by the *bacillus pestis bubonicæ.*

It begins with chills, fever, prostration, swellings of the glands in the neck, axilla, groin ; then follow delirium, vomiting, diarrhœa. The infection may be carried by clothing or merchandise. Rats suffer from the disease, and may spread it. The fleas which infect man and the domestic animals may also be present on infected rats ; these, as they are common alike to both man and animals, may carry the disease to human beings. Ships coming from infected ports may thus carry infected rats and fleas, and so introduce the disease.

PLEURA, PLEURISY.—The pleura is the serous membrane which invests the lungs, and lines the chest wall and upper surface of the diaphragm (midriff). Each pleural sac is entirely closed, and does not communicate with its fellow.

Pleurisy.—Inflammation of the pleura. The pleural membrane becomes thickened and covered with lymph in the early stage, and the roughened, inflamed surfaces rubbing against each other cause the sharp pain and the friction sounds which are heard on listening with a stethoscope (auscultation).

The disease may become arrested and get well at this stage, and leave no important after-effects, or it may progress, and a fluid exudation take place which at times may fill the cavity ; this may become absorbed, or require removal by tapping or aspiration ; the fluid may become purulent, and form an empyema (q.v.).

After the absorption or removal of the exudate it frequently happens, more particularly if both visceral and parietal pleuræ have been inflamed, that dense adhesions between them result ; these may bind the lung down and interfere with its air capacity.

The disease in the majority of cases is excited by micro-organisms such as tubercle bacilli, pneumococci, streptococci, the predisposing causes being exposure to cold and wet, injury. It may arise secondarily to other diseases. Injuries such as blows on the chest, fractures of ribs, crushes, penetrating wounds, &c., may set up pleurisy.

The case of Israel, cited by Becker and quoted by Thoinot, Ollive and Le Meignen and others, appears to afford uncontroverted evidence of the existence of such a clinical entity as traumatic pleurisy. A miner received in the course of his work a contusion of the right side of the chest ; he died suddenly twenty days after the injury ; he was delirious, and his symptoms and signs were ill-defined ; at the autopsy was found recent adhesion of the pleura at the site corresponding to the point of the chest wall struck. (*See* **Empyema.**)

Tuberculous Pleurisy may arise in the ordinary way from infection, or may be excited by injury. It may assume the dry form, or an effusion may develop. It may be the accompaniment of traumatic phthisis, or the injury may determine the localisation of pre-existing bacilli ; these germs may have been, up to the time of the injury, quiescent in the lungs or bronchial glands. It seems, however, to be the more generally accepted theory that the injury has taken effect on a latent or developing pleuritic deposit of a tuberculous nature, and thus expedited its advance. (*See* **Phthisis.**)

Injuries to a tuberculous focus in other parts of the body may set free the bacilli, and they may become located in the pleura. Effort may also, by breaking down old tuberculous pleural adhesions, give a fresh impetus to what was previously a cured, or at any rate dormant, disease.

After an ordinary traumatic pleurisy full recovery will usually take place ; if extensive adhesions follow, or if an empyema has resulted, there may be a considerable reduction in working capacity. After the acute stage of a tuberculous pleurisy of traumatic origin has subsided, it will often be advantageous to the subject to undertake work of a non-fatiguing character, provided that there is a plentiful supply of fresh air. (*See* **Chylothorax. Empyema.**)

Hæmorrhagic Pleurisy (Hæmothorax).—A variety of pleurisy in which the effusion contains blood. It usually follows such chest injuries as cause rupture of the vessels in the lungs or pleuræ. It may be the result of a leaking aneurism, or be a concomitant cancer of the lungs or pleuræ, tumours, penetrating wounds, cirrhosis of liver or chronic nephritis. Strictly speaking, hæmothorax means pure, unmixed blood in the pleural cavity.

Pleural Adhesions.—The presence of these to any great extent, after the active stages of the disease had passed, would no doubt cause incapacity for work. After pleurisy, pain or dragging sensations due to adhesions may be alleged as sufficient to prevent return to work. An X-ray examination with the fluorescent screen will readily show the extent of the excursions of the diaphragm, and associated movements of the lung. If these are less than normal, it may be taken that there is an obstruction to free movement. The sign of Kelsch is of use also. It is carried out as follows : Measure the circumference of the chest at the nipple line during forced expiration, and take another measurement during forced inspiration ; the difference between the two measurements normally is about 5 cm. (2 in.). If in a given case the measurement is 4 cm. ($1\frac{9}{16}$ in.), then there is a suspicion of restriction to the amplitude of respiration. If the figure is 3 cm. ($1\frac{3}{16}$ in.) there is respiratory insufficiency, and if auscultation does not reveal something else abnormal which would explain this, pleural adhesions may be diagnosed.

In the German army, between 1889 and 1892, of 5,910 acute and chronic pleurisies, 69 per cent. were able to complete their service ; in the Austrian army, of 4,225 cases 48.2 per cent. were cured (Rohmer). (*See* **Chylothorax. Empyema. Lung.**)

Pleurodynia.—Pain in the intercostal muscles from rheumatism. It may arise in a rheumatic subject following a slight strain, effort or wrench. It is a painful affection, but does not cause incapacity for more than a few days.

PNEUMONIA.—Inflammation of the Lungs. The disease is usually caused by the diplococcus pneumoniæ (occasionally by streptococci). These, under circumstances favourable to their growth, become abundant in the inflamed portions of the lungs, and their poisonous products are distributed throughout the circulation. These germs are present in the respiratory passages of healthy people, and the exact cause which determines their invasion of the lung is not yet fully known.

Diminished vital resistance of the lung tissue, such as may follow injury, contusion of the lung, alcoholism, disease of the kidneys, &c., is without doubt a predisposing cause. Ballard states that workers in certain phosphate factories are prone to pneumonia (Osler).

The disease in its ordinary form sets in abruptly with a prolonged chill, followed by headache, high temperature, and soon after cough, blood-stained sputum (rusty sputum), pain, rapid breathing; herpetic eruptions on the lips are present in from 12 to 40 per cent. of the cases. The disease, which is a very dangerous one, continues until the fifth to the tenth day, when the temperature, pulse and respiration usually fall rapidly by crisis, but occasionally gradually by lysis (slow but regular subsidence of symptoms).

Traumatic Pneumonia.—The symptoms in this can hardly be distinguished from those of ordinary pneumonia. Injury is more likely to excite the disease in persons who are alcoholic, and in those who have previously had the disorder.

Chronic bronchitis, or an old-standing tuberculous focus and fatigue, are also predisposing factors. The traumatism which initiates the disease is usually a severe one: a fall from a height, a crush of the chest with or without fracture of the ribs, a blow of a fist or a kick; though it has been observed to follow what appear to be lesser injuries, such as a fall to the ground after taking a false step (Brouardel).

The disease usually develops within from ten hours to six days after the injury; the sooner after the injury the more likely is the case to be regarded as of traumatic origin.

The later date should only be accepted if there is pain in the region of the chest struck, rusty sputum, and symptoms of contusion of the lung persisting up to the onset of the distinct and characteristic signs of pneumonia (Thoinot, Sand). On this matter of the lapse of time between injury and development of symptoms, it is important to remember that in some subjects, particularly alcoholics, there may be a latent or ambulatory pneumonia present which has not caused total incapacity; so that in a particular case of alleged injury, if one finds signs of the disease in an advanced stage a few hours after the alleged injury, one might be justified in rejecting the condition as due to that specific injury.

The precursors of traumatic pneumonia are pain in the injured side, ordinarily at the spot where the injury has taken place, accompanied by dyspnœa (difficult or laboured breathing), which is in proportion to the violence of the trauma. Spitting of blood soon supervenes, and is frequently repeated before the appearance of the pneumonia, and it continues during the development. The actual invasion of the lung is usually sharply signalised by chills, or it may progress gradually with the symptoms of malaise, fever and cough, and its course follows that of ordinary pneumonia. Pleurisy is often a well-marked complication. In traumatic pneumonia the chills and herpes are frequently absent.

The important points which favour the making of a diagnosis of primary traumatic pneumonia are: it generally develops on the injured side, and usually has a close relation to the portion of the chest struck. (It is not to be overlooked that injury to the lung does not invariably correspond to the part of the chest injured; a blow in front may take effect on the posterior or even the deep portion.) It is not absolutely necessary that the soft parts or the ribs should show signs of injury. The delay between the trauma and the appearance of the pneumonia should not exceed six days. The points on which the diagnosis can be made without reserve are: ecchymosis of the thoracic wall, fracture of ribs, hæmoptysis soon after injury to the chest wall, blood-stained sputum. *Post-mortem* appearances of pleuritic ecchymosis, or signs of tears or ruptures in the pleura or lung, will, if present, confirm the diagnosis.

The changes in the lung tissue which take place during the course of a pneumonia were formerly described as having a regular sequence: congestion, red hepatisation grey hepatisation, resolution. This is not now believed to be constant, as both forms of hepatisation may exist at the same time in contiguous portions of the lung, and microscopically they may be indistinguishable (Hektoen).

Pneumonia may follow injuries to the head, spinal cord, severe general injuries, sunstroke, burns, chills, falls into cold water, the aspiration of foul water into the lungs, the entrance of foreign bodies, such as a tooth, into the bronchial tubes, or inhalation of irritating fumes.

It may also occur as a complication of blood poisoning, or during the course of confinement to bed, in the dorsal, recumbent position, for a serious injury or disease (hypostatic pneumonia). Amongst the complications of pneumonia are found extensive pleurisy, empyema, pericarditis, endocarditis, meningitis, jaundice, and, as a later sequence, phthisis.

The prognosis is dependent mostly on the extent of the injury to the thoracic contents. If the traumatic pneumonia is uncomplicated, and resolves well, there will usually be full restoration to health. (*See* **Lungs, Phthisis, Pleurisy.**) See also an interesting article by E. M. Payne, *Brit. Med. Journ.*, January 16th, 1909.

PNEUMOTHORAX.—Air in the pleural cavity. The usual cause of this is a perforation of the lung due to a rupture of a tuberculous cavity, abscess or emphysematous air vesicles; penetrating wounds, fractures of ribs, &c. It may occur as a result of rupture of a normal lung following violent, straining efforts, or even at rest (Osler). In diseased states of the lung it may follow a simple contusion ; even sneezing may cause it ; it may be merely coincidental, the disease in the lung having arrived at a stage at which rupture was imminent, and any normal physiological act, such as defecation, cough, &c., would have produced it. The symptoms are usually sudden pain in the chest, great difficulty in breathing, cyanosis, collapse, possibly death. The mortality in all cases appears to be about 70 per cent (Butler).

If recovery takes place in the simple, non-tuberculous cases, restoration to health may be complete later.

POSTERIOR THORACIC NERVE.—External Respiratory Nerve of Bell. It comes from the 5th, 6th and 7th cervical nerves, pierces the scalenus medius muscle, and descends behind the brachial plexus and first stage of axillary artery to the lower border of the serratus magnus muscle, which it supplies. If this nerve is injured or severed there is paralysis of the serratus magnus. The action of this muscle in health is to draw the shoulder-blade (scapula) forward, and by rotating the inferior angle forward and upward raise the arm ; it holds the inner border of the bone to the chest wall. When the nerve is diseased there is paralysis of the serratus magnus muscle, and consequent difficulty in raising the arm above the horizontal position, and the movements of the shoulder are impaired, with inability to perform forward, pushing movements. The condition is known as scapulum alatum (winged scapula), the inner border of the scapula is prominent, and has ceased to be in contact with the chest wall.

The affection is sometimes found in cases of progressive muscular atrophy (q.v.). It may be caused by wrenches of the arm and shoulder, falls on the shoulder, blows on the neck, wounds involving the nerve. The course of the disorder is very prolonged ; recovery takes place in one third of the cases only (Bailey). Nerve anastomosis, with the posterior cord of the brachial plexus, may sometimes be successful, or a portion of the pectoralis muscle may be transplanted from the arm to the inferior angle of the scapula ; but a large proportion recover without operation under careful treatment (Sherren).

The incapacity consists in weakness and loss of power in the diseased arm, so that the patient is totally incapacitated for heavy work requiring the use of both arms and hands.

POSTERIOR TIBIAL NERVE is deeply placed in the calf of the leg, and supplies the muscles at the back of the leg and the sole of the foot. It may be injured by wounds or by crushes of the leg, damaged by the sharp ends of a fractured tibia, or involved in the callus of a healed fracture. When paralysed there is loss of extension of the foot and flexion of the toes, and loss of sensation in the toes and sole, and the foot may assume a position of talipes calcaneus (q.v.). Suture of an injured posterior tibial nerve may be difficult on account of its depth and its close relation to the vessels.

PROGRESSIVE MUSCULAR ATROPHY (Creeping Palsy).—A chronic disease, characterised by progressive wasting of muscles and paralysis, due to degeneration of the anterior horns of the spinal cord, and consequent degeneration of anterior nerve roots and muscles. In one type the disease begins in the muscles of the thumb and interossei muscles of the hand, and it may omit the intervening muscles and attack the muscles of the shoulder, or it may begin with pains in the shoulder, and the wasting of muscle may progress from above downwards. The hand becomes flattened and thin, and there is loss of power for flexing the wrist or extending the fingers ; the claw hand (*main en griffe*) results.

The other hand usually becomes diseased in from three to nine months. The wasting of muscle progresses, and spreads to the deep muscles of the back, hip and thigh ; there are fibrillary twitchings, and there may be early loss of knee-jerks ; the electrical irritability of the muscles is at first diminished, and later there may be a reaction of degeneration. The disease may very closely resemble amyotrophic lateral sclerosis (*see* **Lateral Sclerosis**), in which case the knee-jerks will be exaggerated. The affection progresses with remissions, death being due to involvement of the laryngeal and respiratory muscles. The average duration of life is ten years.

The causes of the disease are believed to be syphilis, exposure to cold and wet, mental strain, infectious diseases, fevers, lead-poisoning. The relationship of trauma is considered by some to be established : injury to a limb which has caused atrophy of muscles has been followed by a general condition of muscular atrophy. Blows on the back, head or neck, accidents causing concussion of the spine, falls on the feet from a height, have all been noted as causes. In this disease the wasting precedes the paralysis, and as it is an objective sign, it will usually be the first fact on which a diagnosis is made. This wasting makes its appearance soon after the injury as a rule, but according to Ollive and Le Meignen, the interval may vary from fifteen days to three years. Such a long period as the last should hardly be accepted without good evidence, such as difficulties in motility and alterations in sensation, and some continuity in the symptoms which followed immediately after the injury.

A considerable number of the cases appear to develop from about one to three months after injury. Once the disease is established and gives evidence of its progressive character, there will soon be a definite degree of incapacity for work. The traumatic origin of this disease is not accepted by all authorities. Some, such as Sachs and Freund, Kurt Mendel, &c., hold that the injury awakens the disorder in predisposed persons, or that it aggravates an already existing lesion.

PROLAPSE OF THE UTERUS (Falling of the Womb). —This may occur after injuries, such as falls, violent efforts in women who have borne children, and, in particular, in those who have had a ruptured perineum during childbirth. This latter is the more usual cause of it ; injury as a cause must be extremely rare.

A case of old-standing prolapse will be recognised by the skin-like character of the mucous membrane, or by the presence of ulcers caused by the irritation of clothing. If there is complete prolapse there will be great incapacity for work ; partial prolapse will not cause, as a rule, much unfitness for work.

PROVOCATION.—The production of lesions for the purpose of causing incapacity for work. Such artificial production of disease is not common. The methods most usually adopted are the placing of irritating substances in the eye to produce a conjunctivitis, the application of blisters or irritant drugs or chemicals on the hands or arms to cause a dermatitis, the tying of tight bands round the leg or thigh in order to develop varicose veins. The dilatation of the inguinal canal by means of the finger or a blunt instrument with the object of inducing a hernia is not unknown. It has also happened that persons have mutilated themselves to establish a claim for compensation, and sometimes a provocation which appeared to be intended as merely a slight injury has resulted in death—slight wounds have become septic, and blood poisoning has ensued.

Few, if any, of these artifices can be carried on for long without detection ; and with regard to mutilation, the procedures of the law in investigating the evidence of accident will materially assist the solution of the problem.

The aggravation or acceleration of an industrial disease or injury may be actively provoked by the patient interfering with the treatment, or being deliberately negligent in carrying out the instructions of his medical attendant. It is rare to find patients removing the splints from a fracture or disturbing the dressings of a wound, but it is a matter of frequent observation that the subjects of hernia throw aside the truss and continue work without it.

It is possible that in this matter of wearing a truss a workman may fear that if it became known that he required such an instrument he might lose his employment. On the other hand, he may not recognise the very grave risk he runs of strangulation, and a very possible fatal result.

But it is not to be forgotten that this discarding of a truss may be purposely done with the intention of encouraging a small, incomplete hernia to become a complete one. The aggravation of an injury by treatment at the hands of quacks of the bone-setter and bloodless-surgeon class is well known to the medical profession; but it seems very probable that as in the near future workmen will have greater opportunities and more leisure to read and think for themselves, they will not so readily fall a prey to those unscrupulous people who thrive on human credulity.

Undue prolongation of incapacity after an industrial disease or injury may be the result of frequently-renewed irritation to the part—as in the application of friction to an ulcer to keep it open—or it may be due to the refusal to have a small operation (*see* **Operation**) done. This was the case in a person who had a fracture wired, and when the broken bones had healed and the wire had done its work it had produced some irritation, and a discharging sinus ensued, yet the patient declined to undergo the extremely simple procedure for the removal of the wire. Prolongation of incapacity is a matter which is often before courts. The question arises usually in the application for a termination of the compensation; and as grave injustice may be done to an employer or a workman, it behoves medical men to be careful in their examination, and not be too hasty in forming an opinion. (*See* **Malingering.**)

PSORIASIS.—A disease of the skin characterised by patches of whitish scales on a red ground distributed over the extensor surfaces of the body. It is common at all ages, but rarely develops after fifty (Morris). There may be an inherited predisposition, or there may be an underlying gouty or rheumatic diathesis. In persons who are already the subject of this disease, a scratch may determine the formation of a new patch. Cases are recorded in which emotion, wounds, shock, and the action of cold have incited an attack. Aronheim records, in *Monatsschr f. Unfallheilk*, Feb., 1906, xiii, 2, p. 36–38, the case of a man of sixty-seven who slipped and contused his right leg. Ulceration followed, and a year after a plaque of psoriasis appeared on the injured spot. Neither the patient nor his parents ever had the disease before.

The eruption, as a rule, disappears under treatment for a time, and then recurs. If an extensive area of the body is attacked, or if the skin becomes cracked, there may be total incapacity for a short period, but usually the disease does not cause any great incapacity for work.

RADIAL AND POSTERIOR INTEROSSEOUS NERVES.—These may be injured in fractures and dislocations, damaged by fractures or dislocations involving the upper end of the radius; the radial may be affected by injury at the elbow or at its lower end near the wrist. The posterior interosseous as it lies on the interosseous membrane may be involved in fractures of the shaft of either radius or ulna. These nerves, as they are terminal branches of the musculo-spiral, will, if injured at the bifurcation, have signs and symptoms resembling damage to the main trunk. (*See* **Musculo-spiral Nerve.**)

In injury to the radial nerve alone at the wrist there will be loss of sensation over the ball and outer edge of thumb, and over the back of the thumb; it seldom extends to index and middle and outer half of ring finger, as would be expected from the anatomical distribution. This loss of sensation may cause a considerable amount of incapacity for delicate work and render the hand easily damaged. Complete section of this nerve in the upper part of the forearm may produce no loss of sensation.

If the posterior interosseous is damaged there may be the characteristic drop wrist, and if the nerve is torn across this will be permanent, unless operative suture can be carried out. If the fracture or dislocation is treated early, and the nerve escapes being torn, the prognosis is, as a rule, good. (Sherren.) (*See* De Witt Stetten in *Annals of Surgery*, August, 1908.)

RADIOGRAPHY (Skiagraphy, Röntgenography).—Photography by means of the X or Röntgen rays. The value of this aid to diagnosis, treatment and prognosis is very fully recognised in injuries or diseases affecting bones, and also in demonstrating internal disorders, such as aneurism, renal calculus, &c.

Most probably in the near future we shall be able to record on the X-ray plate diseased conditions in the softer tissues of the body, so that torn ligaments and displaced cartilages will be matters capable of absolute proof. For the present it is certain that all injuries to bony structures about which there may be any doubt as to the diagnosis should be submitted to the X-rays as soon as possible ; even if the diagnosis is fairly clear beforehand, the X-rays will show the nature and amount of displacement, if there is any, and so guide the treatment and indicate the prognosis.

The interpretation of the X-ray negative or print, or the appearances on the fluorescent screen, is not such a simple matter that opinions on the recorded shadows can be given by anyone ; even medical men, unless they are constantly familiar with the technique of radiography, are liable to form incorrect opinions. It is of great importance to remember that the shadow recorded on the photographic plate by the rays may show a much greater amount of deformity or displacement in cases of bone injuries than actually exists. (*See* **Electricity.**)

RADIUS.—The bone of the forearm situated on the thumb side.

Fractures of this bone may occur at any part ; those of the head and neck are frequently associated with damage to the lower end of the humerus, and thus involve the elbow-joint. They may get quite well without much deformity or impairment of the movements of the joint, or there may be more or less anchylosis. (*See* **Elbow.**) In fractures of the shaft of the bone, if there has not been much comminution of the fragments, and if the bones unite in a good position, the arm will be very little impaired; but if there is displacement of the ends and much callus thrown out, there will be limitation of the movements of pronation and supination and consequent diminution in the power of the arm. Sometimes, even in bad fractures with an excessive formation of callus, by persistent movements and the natural tendency for callus to diminish, there will result after a time a very useful arm. Non-union may occur and require operative treatment, which is usually successful. (*See* **Carpus. Colles' Fracture. Radial Nerve.**)

Dislocations of the radius may occur at the upper or lower end; in the upper end in a forward, backward or outward direction.

They are generally easily reduced, but if found impossible an open operation may be required. The prognosis of dislocations of the upper end alone is not very favourable, because frequently the retaining ligaments are torn, and the condition may become one of recurrent dislocation.

Dislocations of the lower end involve the wrist-joint and the ulna is often included in the displacement, so the condition is practically that of a dislocation of the wrist. The after-results are usually very good.

Dislocations of the lower end of the radius from the lower end of the ulna may occur; they arise more especially from such a twisting force as is used in wringing clothes. There is sometimes great difficulty in retaining the bone in position after reduction, particularly if there has also been a fracture of the lower end of the radius, and consequently the full functional use of the hand may be diminished.

If any of these injuries are compound there is the increased risk of sepsis and subsequent complete anchylosis, if the patient escapes the immediate dangers of septic poisoning. (*See* **Carpus. Upper Limb.**)

RAGPICKERS' DISEASE. (*See* **Hadernkrankheit.**)

RAILWAY BRAIN (Railway Spine). (*See* **Back. Neurasthenia.**)

REACTION OF DEGENERATION (R.D.). (*See* **Atrophy.**)

REFLEXES.—These are actions or movements which take place in response to a stimulus. The contraction of the pupil of the eye and the closing of the eyelid if suddenly exposed to a bright light are examples of a reflex action.

The Knee-jerk or knee reflex is another elicited reflex action, the explanation of this being, if during the examination of a patient the patellar tendon is struck or tapped when one leg hangs loosely flexed over the over, the tap causes a stimulus to be conveyed up a nerve to the motor cells in the spinal cord ; these cells transform this stimulus into an impulse which travels rapidly down a motor nerve to the muscle which it supplies ; the muscle involuntarily contracts, and so the leg jerks up in response to each tap.

This reflex action occurs in about one-twelfth of a second.

The knee-jerk is absent in neuritis of the lower limbs, locomotor ataxia, immediately after injuries to the cord, &c. It is exaggerated in lateral sclerosis, transverse myelitis, injuries to the spinal cord (a late effect), hysteria, neurasthenia.

Ankle Clonus is a reflex produced by slightly flexing the leg and thigh, the examiner then presses up sharply with one hand on the sole of the foot, the other hand holding the patient's heel ; the calf muscles contract, forcing the foot to point down and then rhythmic movements of the foot set in.

True ankle clonus is always abnormal.

Babinski's Reflex.—Extension of the great toe instead of the flexion which is usual when the sole of the foot is tickled. It is present in certain lesions of the spinal cord disease of the pyramidal tracts), and indicates organic changes.

RESECTION OF JOINTS.—The excision or removal of a joint for injury or disease. After removal of the **shoulder-joint** there usually results quite a useful new joint formation with a good amount of control and a wide range of movement, but there is, of course, a great deal of loss of power in the limb.

A flail-like and consequently a weak joint is not of infrequent occurrence after excision of the **elbow**. An instrumental support or another operation may be necessary for the purpose of securing a bony anchylosis in a good position. (*See* **Elbow.**)

In resection of the **wrist** there is as a result great weakness of the hand even if the movements are good ; there may be complete anchylosis. (*See* **Carpus.**)

After resection of the **finger-joints** there will very often be anchylosis. (*See* **Fingers.**)

In the **hip-joint** anchylosis is frequent after resection and the incapacity is not total. (*See* **Femur.**)

In excisions of the **knee** and **ankle** solid or anchylotic union is aimed at, and the disability is in proportion to the position attained and the work required to be done after recovery. If these joints become flail-like, the limb is greatly weakened.

RHEUMATISM.—This disease may occur in an acute or chronic form. Its nature is not quite fully known, most likely it is a disorder of microbic origin (Poynton and Paine). It may arise without any very clearly-defined cause or it may follow exposure to cold, chills, &c. It may also follow injury to a joint, contusion, wrench, intra-articular fracture, effort, &c. If it follows trauma it ought to appear within a fortnight after the injury (Sand), but it is necessary to note that the very large majority of cases of acute rheumatism or rheumatic fever set in without the least relation to injury.

Rheumatism in its chronic form attacking an injured joint may considerably delay recovery from injury. Rheumatic fever may last from a few days to six or eight weeks; the prognosis is usually favourable, and if the heart escapes damage there will usually be full restoration to health. The disease may assume a chronic form and cause limitation of movements in joints and pain. (*See* **Arthritis. Joint.**)

RIBS.—These bones form the walls of the chest or thorax; some are attached to the breast-bone or sternum in front and all to the dorsal vertebræ behind. They are twelve in number on each side, and the upper are named the true or sternal ribs (seven in number), joined directly to the sides of the breast-bone by means of cartilage. The lower five are the false ribs; the upper three of these are connected to each other by cartilage which connects them to the sternum. The last two (eleventh and twelfth) are free or floating ribs. The spaces between the ribs are filled in with muscles; each intercostal space has also an intercostal nerve and blood vessels.

The ribs being very elastic are able to withstand a great amount of pressure without fracturing, but direct fractures occur at the point struck after blows, kicks, falls, &c.

Indirect fractures occur after crushes, running over, accidents, &c., and take place at the part of the rib which is bent forcibly. The same violence may act both directly and indirectly (Poland).

Fractures of the ribs may occur after violent efforts or sneezing, coughing, lifting a heavy load, swinging of scythe, during gymnastic exercises.

Fracture of ribs occurs in insane patients very readily: this appears to be due to the way in which a restless or struggling patient throws himself into such a posture that a very slight pressure is enough to produce the fracture (Claye Shaw).

Dislocation of the ribs is rare. It is said to have occurred after violent exercise with dumb-bells (Bell), also by the constant action of the pectoral muscles in kneading bread (Bransby Cooper). The lower cartilage of the ribs may be displaced either forward or backward ; this may occur, according to Poland, by lifting a heavy weight, struggling, &c. ; it is not easily reduced, and may recur.

The complications of fractures and dislocations of the ribs are those of injury to the contents of the thorax ; these will depend on the nature of the accident. There may be damage to pleura, lung, heart, vessels, &c. There is usually very little loss of function after a broken rib has healed, but the intercostal nerve may be grasped in the callus and persistent neuralgia follow. The nerve may possibly be released by operation and a cure result. A radiograph will show the amount of displacement and extent of the callus. If the pain is severe, or if it occurs on raising the arm, the incapacity may be from 20 to 50 per cent. or more (Golebiewski). (*See* **Aorta. Heart. Pleura. Lung.**)

SCAPULA (Shoulder-blade).—A flat, triangular bone, part of the shoulder girdle. It lies on the back, on the upper ribs, over which it is very freely movable. At the upper and outer angle is a shallow, cup-shaped depression (glenoid cavity), into which the head of the humerus (arm bone) fits, forming the shoulder-joint. On the posterior surface of the bone there is a prominent ridge, the **Acromion Process,** which passes outward and forward, and articulates with the outer end of the clavicle, overhanging the shoulder-joint.

The Coracoid Process is a strong bony projection of the scapula, internal to the joint of the shoulder, to which the coraco brachialis, pectoralis minor, and one head of the biceps muscles are attached.

The scapula is of great importance in connecting the arm with the body. Its thinner portions are thickly covered with muscles, and the exposed parts of it are unusually strong masses of bone. For this reason fractures are rare, and the violence which causes these must be great, and is usually direct. Fractures occur of the body, neck, coracoid and acromion processes.

Fracture of the Neck, as it detaches the glenoid cavity, produces symptoms somewhat similar to dislocation of the shoulder. After recovery from this fracture, there very often remains restriction in the movements of the shoulder, and sometimes considerable atrophy of muscle. The brachial plexus (q.v.) may be damaged by the violence which caused the fracture.

In **fractures of the Coracoid Process** healing mostly takes place without displacement, and few after-effects ensue. If there is much displacement outwards, there may be interference with the free movements of the shoulder, and a severe operation may be required for release.

Fractures of the acromion usually get well rapidly, as there is not much separation of the fragments except after extreme violence. There may result some flattening of the shoulder, but generally speaking the incapacity does not last long.

Fractures of the body, if uncomplicated with other injuries, usually heal up well without any prolonged after ill-effects.

SCHEDULE OF DISEASES OR INJURIES FOR WHICH COMPENSATION CAN BE CLAIMED :—

DESCRIPTION OF DISEASE OR INJURY.	DESCRIPTION OF PROCESS.
Anthrax.	Handling of wool, hair, bristles, hides and skins.
Lead poisoning or its sequelæ.	Any process involving the use of lead or its preparations or compounds, or handling of lead or its preparations or compounds.

Mercury poisoning or its sequelæ.	Any process involving the use of mercury or its preparations or compounds.
Phosphorus poisoning or its sequelæ.	Any process involving the use of phosphorus or its preparations or compounds.
Arsenic poisoning or its sequelæ.	Any process involving the use of arsenic or its preparations or compounds, or handling of arsenic or its preparations or compounds.
Ankylostomiasis.	Mining.
Poisoning by nitro- and amido-derivatives of benzene (dinitro-benzol, anilin and others) or its sequelæ.	Any process involving the use of nitro- or amido-derivatives of benzene or its preparations or compounds.
Poisoning by carbon bisulphide or its sequelæ.	Any process involving the use of carbon bi-sulphide or its preparations or compounds.
Poisoning by nitrous fumes or its sequelæ.	Any process in which nitrous fumes are evolved.
Poisoning by nickel carbonyl or its sequelæ.	Any process in which nickel carbonyl gas is evolved.
Poisoning by Gonioma Kammassi (African boxwood) or its sequelæ.	Any process in the manufacture of articles from Gonioma Kamassi (African boxwood).
Chrome ulceration or its sequelæ.	Any process involving the use of chromic acid or bichromate of ammonium potassium, or sodium, or their preparations.

Eczematous ulceration of the skin produced by dust or liquids, or ulceration of the mucous membrane of the nose or mouth produced by dust.	
Epitheliomatous cancer or ulceration of the skin, or of the corneal surface of the eye, due to pitch, tar, or tarry compounds.	Handling or use of pitch, tar, or tarry compounds.
Scrotal epithelioma (chimney-sweeps' cancer).	Chimney sweeping.
Nystagmus.	Mining.
Glanders.	Care of any equine animal suffering from glanders; handling the carcase of such animal.
Compressed-air illness or its sequelæ.	Any process carried on in compressed air.
Subcutaneous cellulitis of the hand (beat hand).	Mining.
Subcutaneous cellulitis over the patella (miners' beat knee).	Mining.
Acute bursitis over the elbow (miners' beat elbow).	Mining.
Inflammation of the synovial lining of the wrist-joint and tendon sheaths.	Mining.
Cataract in glassworkers.	Processes in the manufacture of glass involving exposure to the glare of molten glass.
Telegraphists' cramp.	

SCIATIC NERVE.—The large nerve in the back of the hip and leg. It supplies the muscles which rotate the hip and flex the leg. If severed the leg is paralysed and there is loss of foot movements with loss of sensation below the knee. The prognosis will largely depend on the possibility of operative suture; if this can be done early the outlook is more hopeful, but at the best recovery is hardly likely to take place before the lapse of three years after operation (Sherren). See Mackenzie, *Annals of Surgery*, July, 1909, for interesting case of resection and bridging of a gap of 10¾ inches in this nerve.

SCIATICA.—Pain in the sciatic nerve due to inflammation of the sheath. The sciatic nerve may be injured in dislocations of the hip, wounds at the back of the hip or in the pelvis; by blows, contusions or falls on the buttock, strains or sudden jerks of the thigh and hip muscles. In incomplete injuries to the sciatic for some unknown reason the portion which forms the external popliteal or peroneal nerve is damaged most often; the internal popliteal, which terminates in the posterior tibial and plantar nerves escapes. (Makins, Sherren.) The pain in sciatica shoots down to the heel, and exercise such as walking on gravel or uneven ground may increase it. There is also pain if the leg being extended, the hip is flexed; wasting of muscle and weakness of the limb, and a reaction of degeneration may be present. The body in walking leans over to the affected side. The disease may ensue from exposure, sitting on hard seats, gout, rheumatism. Recovery generally takes place, in the majority of cases, in six months; but it may occasionally last much longer, and it is liable to recur. (*See* **Atrophy.**)

SCOLIOSIS (Lateral Curvature of the Spine).—It may be congenital, or it may arise from disease or injury to the bony or muscular structure of the back; it may be of mechanical origin following anchylosis of the ankle, knee or hip joints in a flexed position, or pleurisy, empyema, paralysis. It may be functional.

The prognosis will depend on the cause of the condition, which in adults is generally permanent, being then much more in the nature of a deformity than a progressive or active disorder. A moderate amount of scoliosis may cause hardly any incapacity for work of a non-laborious character. (*See* **Back. Spine.**)

SENILITY.—There can be no doubt that a severe injury to a person fifty years of age and over may rapidly increase the advent of the distinctive features of old age. It is a matter of common observation that illness or injury may overtake a man in what appears to be good health, and leave him broken, aged, feeble, and incapable of earning a living by his own exertions. A moderate sclerosis of the arteries which may exist before an injury may make rapid progress after it. All the characteristics of a senile dementia may appear, and be properly attributable to an injury. (*See* **Age. Arterio-sclerosis. Insanity.**)

SEPTICÆMIA.—A condition of blood poisoning due to the entrance of pathogenic germs into the system. It may occur after wounds, and in the course of such diseases as anthrax, typhoid, pneumonia, &c. When the poisonous material enters through a wound, the disease usually shows itself within the next four days by chills, fever, high temperature ; the outlook is serious, and as a result, if the patient recovers, the general health may be impaired.

Pyæmia is a septicæmia, with the addition of the formation of abscesses in various parts of the body : these may form in the lungs, liver, heart, kidneys, joints, &c. The prognosis in pyæmia is more unfavourable than in septicæmia. These diseases may follow even small wounds, or the infection may enter through an abrasion of the skin which was unnoticed by the patient.

Toxæmia.—A poisoning of the system by toxins. These toxins are poisonous substances, secreted or in some unknown way produced by bacteria which have invaded the body.

SHOCK.—A term used to designate sudden depression of the vital functions, produced by injury, emotion or other causes. The nervous system is first affected, and through it the circulatory system; the effect may be slight, profound, or even fatal. People in delicate health, the aged and young, readily suffer from shock. The condition may quickly be recovered from if no vital organ is injured in the trauma, or if the cause is not persistent.

Many of the results which follow accidents in which shock is observed are not due to a single condition, but are a mixture of emotional disturbance, shock, hæmorrhage, collapse, pain, injury to vital organs. Failure of a diseased heart may follow a psychic shock; it is scarcely probable that a healthy heart would stop for this cause alone. Psychic, or emotional or mental shock, is a term used to denote fright, sorrow; even joy has been included.

Such diseases as chorea, epilepsy, exophthalmic goitre, paralysis agitans, neurasthenia, hysteria are believed to have developed in some cases after sudden emotional disturbance. Sometimes a horrifying occurrence makes such a profound impression on the subject that he has the greatest possible difficulty in freeing himself from its recurrent realisation, and the subsequent mental depression may almost amount to insanity (q.v.).

The nervous symptoms of shock, and the late results which follow concussion accidents, may be due to some actual minute lesions in the nervous centres, or to an alteration of function without visible lesion. (*See* **Brain. Concussion. Head Injuries.**) Crile, from his experiments on surgical shock, makes a distinction between shock and collapse. Shock, he believes, is a more gradually developed condition of depression, due to exhaustion of the vasomotor mechanism, that is the delicate and sensitive nerve mechanism which controls the contraction and dilatation of the blood-vessels ; collapse is the very sudden depression which follows heart failure, hæmorrhage, &c. Shock and collapse are dangerous complications of severe or prolonged operations.

SHODDY FEVER.—A febrile disease which occurs in workers who are new to the trade of shoddy making. In this process the wool contained in rags is extracted ; these are ground up by machinery, and large quantities of dust are given off, the inhalation of which causes symptoms not unlike influenza—headache, cough, rise of temperature, chills, pains in the limbs. The symptoms subside in a few days after leaving work, but they are liable to recur.

SHOULDER-JOINT.—The joint between the head of the humerus and the glenoid-cavity of the scapula (q.v.). It is a ball and socket joint ; the capsule is loose and permits an extensive range of movements. The long tendon of the biceps muscle passes through the interior of the joint, and assists the glenohumeral and other ligaments in strengthening the capsule. For dislocations and fractures *see* **Humerus.**

Simple Contusions or injuries of a more severe nature may set up a synovitis or an arthritis, which may result in anchylosis of the joint and consequent limitation in the movements, but as a rule a simple synovitis will be quite recovered from in two months. If injury involves the circumflex nerve (q.v.) the full use of the arm may be impaired for a long time or even permanently. Injuries to the bursæ about the joint may cause pain on movements of the arm, but such cases usually get well, although sometimes a prolonged course of treatment is necessary.

Sprains of the shoulder-joint may be very painful, and be followed by atrophy of muscles and relaxation of the ligaments, or they may have, as a sequel, synovitis and the formation of adhesions and anchylosis or arthritis. Suppurative arthritis or open wounds of the joint may be very serious results of injury; these sometimes end in anchylosis, resection of the joint or even amputation.

Tuberculosis.—*See* **Joint.**

Dislocation of the long head of the biceps may occasionally occur in connection with a dislocation or fracture of the head of the humerus; it is rarely recognised as occurring alone. The tendon can be felt as a cord which slips in and out of its groove; when out it causes interference with the extension of the forearm. It may be difficult to retain the tendon in the groove, and consequently there may result some restriction in the full use of the arm. (*See* **Arthritis.**)

SIGNS.—Objective, Subjective.

An objective sign of a disorder is one that is apparent to the trained senses of one or more observers.

A subjective sign is one that is apparent only to the patient.

A subjective sign may be sometimes converted into an objective one, as in the tests of Mannkopff and Bechterew.

In these, pressure on a subjectively painful part reveals objectively that a genuinely painful impression has been produced, the evidence of this being a quickened pulse rate, or an increase of blood in the face, and dilatation of the pupil. (*See* **Backache. Malingering.**)

SIXTH NERVE.—This nerve comes from the under surface of the brain, between the pons and medulla, and is at first deeply placed in contact with the base of the skull. It enters the orbit by the sphenoidal fissure to supply the external rectus muscle of the eyeball. Paralysis of this nerve may be produced by injury in fractures of the base of the skull, or it may be a sign of intracranial disease. If damaged, there may be partial or complete paralysis of the external rectus muscle of the eye, the patient complains of double vision, and shows inability to move the eye outwards, and a turning of the head to the paralysed side. If permanent, it causes serious disability. I recently saw a case in which paralysis of this muscle was the only late symptom of a compound fracture of the vault of the skull caused by a piece of iron spouting falling on the head from a roof.

SPERMATIC CORD contains the *vas deferens* with its artery, the spermatic artery and plexus of veins (pampiniform plexus), nerves, vessels and lymphatics. It passes through the inguinal canal to the scrotum. The *vas deferens* is the hard, cord-like tube which proceeds from the globus minor or tail of the epididymis of the testicle. The most usual accident in which the cord is injured is as a complication of crushes of the scrotum and testis, or injuries involving the pelvis, kicks, blows, &c. Severe hæmorrhage may follow, and an operation be required for this, or for the removal of the testicle.

Rupture of varicose veins in the cord may occur after effort, strain; in this there is a sudden, sharp pain and a feeling of something having given way. The *coup de fouet perineal* of Sebileau. The duration of the incapacity will depend on the amount of blood effused. It will probably be several weeks. (*See* **Varicocele.**)

Torsion of the spermatic cord and testicle is a rare accident which is predisposed to by lack of the normal fixation or abnormal length of the cord; the twist may follow an effort or strain more or less violent—a cough or sneeze; it may also occur spontaneously. It gives evidence of its occurrence by pain, swelling and finally gangrene. The organ may be saved by early operation. (*See* **Hæmatocele. Testicle.**)

SPINE (*see also* **Back. Kyphosis. Lordosis. Myelitis. Neurasthenia. Scoliosis,** and the various recognised disorders of the spine and spinal cord, disseminated sclerosis, locomotor ataxia, &c.).

Severe injuries involving the bony structure of the spine will show themselves by irregularities on palpation or on the radiograph, and in addition there will be associated signs of injury to the spinal cord. These signs are disorders of sensation and motion, which may amount to total paraplegia.

Injuries involving the spinal cord to any great extent are not often fully recovered from.

Cervical Vertebræ (Cervical spine).—The cervical vertebræ are seven in number. The first one, next the head, is also called the atlas; the second is named the axis. Injuries to these vertebræ derive all their significance from the associated damage to the spinal cord. Tears, contusions, hæmorrhages, dislocations and fractures occur. Dislocations are more frequent in this region than fractures. Fracture-dislocation also can take place. Fractures and dislocations of the atlas or axis are particularly dangerous. According to Gurlt, fractures or dislocations here are not always fatal; they may not give rise to any symptoms beyond a stiff neck. Injuries above the fourth cervical frequently produce immediate death (broken neck). In exceptional cases of injury above the fourth cervical vertebra, the patient has survived fifteen months (Shaw), fourteen years (Hilton).

In injuries at the fourth there may be paralysis of arms and legs, but the scapular muscles may act; there is anæsthesia from the second intercostal space and all over the arms. The diaphragm may be the only muscle of respiration which escapes; being supplied by the phrenic nerve which comes from the third, fourth and fifth cervical nerves, it may be above the seat of injury.

In injury at the fifth cervical vertebra the biceps, supinator longus and brevis, brachialis and deltoid escape. The triceps and pronator muscles may also escape if injury is somewhat lower down. The anæsthesia extends from the second intercostal space, and there may be sensation present in radial side of arms. The patient can raise arms and forearm. In injury at sixth and seventh cervical vertebræ paralysis is limited to below the elbow as to arms. The anæsthesia is from the second space, and includes the ulnar side of the arms. In these cases there is also paralysis of lower limbs, bladder, rectum, &c. The symptoms, which are generally due to ruptures of the cord, may also be due to slow compression, and then there will be some delay in their appearance — seventy-one days (Bernstein). Such severe injuries as these are usually fatal. Traumatism may be the exciting cause of tumour, abscess, caries, &c. With regard to the knee-jerks (*see* **Reflexes**), very slight injuries to the cervical region of the cord may cause immediate exaggeration of the knee-jerk with foot clonus (q.v.). In severe injuries it is diminished or abolished at first, to become exaggerated later. It may be absent for weeks or months and return increased. The longer it remains absent the more severe the lesion. In total transverse rupture or crushing of the cord in the cervical and also in the dorsal regions, the knee reflex is lost after the injury, but even in such desperate cases the reflex, if the patient survive, may return after many weeks. Absence of the reflex cannot of itself be taken as absolute proof of complete section of the cord (Bailey).

Dorsal Vertebræ.—The dorsal vertebræ are twelve in number, and have the posterior ends of the ribs attached to them. Injuries causing fracture or displacement may set up inflammatory changes or hæmorrhages, &c., as in the cervical region, the danger being dependent on the amount of damage to the contained cord. The symptoms of injury to the cord in the upper and mid-dorsal regions are, motor paralysis of the lower limbs, abdominal muscles, bladder and rectum ; the anæsthesia extends up to about the lower end of the breast bone ; there will be retention of urine, and perhaps incontinence of fæces.

Injury to the lower dorsal region of the cord will cause paralysis of the lower limbs, bladder and rectum, with anæsthesia up to the level of the navel.

The Lumbar Vertebræ.—These are five in number, and are the strongest of all the vertebræ. Injuries in the region of the twelfth dorsal and the first two lumbar vertebræ may involve the cord, and cause partial or complete paralysis of the muscles of back, hip, thigh and leg, irregular distribution of the anæsthesia, pain, retention of urine and incontinence of fæces, usually loss of patellar and plantar reflexes.

Injury below the second lumbar vertebræ may involve the cauda equina (the tail of the spinal cord, consisting of the bundles of the sacral and coccygeal nerves). The symptoms would probably be, not much pain at first, but more severe later, widespread but irregularly distributed anæsthesia, incomplete paralysis of the lower limbs and pelvic organs; if the cord is injured as well, there will be more symmetry and completeness in the paralysis. Death occurs in many of these cases early, from the severity of the primary violence. If patients survive the severe injuries, grave complications, such as bronchitis, pneumonia, cystitis, &c., may terminate life after some days, weeks or months of suffering. Fractures and dislocations of the vertebræ alone, or with slight involvement of the cord, may be recovered from. Kyphosis or Kummel's Disease may follow (q.v.). Operative interference sometimes gives good results in suitable cases, but on the whole complete recovery is rare.

Tuberculosis of the spine, Pott's Disease.—Angular curvature may set in as a sequence to injuries, the trauma being either the localising factor in a general tuberculous infection of some standing, or it may excite into activity a latent or quiescent focus. (*See* **Joint.**) It may be arrested by early treatment, or the disease may progress and an angular curvature (Kyphosis) form, or suppuration ensue, and complete incapacity and even death result. (*See* **Tuberculosis.**)

Rupture or laceration of the muscles of the spine.—The fibres of these muscles may be torn by falls on the back, wrenches, lifting heavy weights, carrying a load on one shoulder. If the tear is extensive there will be an effusion of blood under the skin, and, later, the irregular, torn ends may be visible or felt; there will be pain at first on movement, but this diminishes later, though there may remain difficulty in bending the back, and inability to lift heavy weights for a long time.

In **Rupture of the latissimus dorsi muscle** there will be difficulty in placing the arm behind the back ; recovery may eventually take place.

Tumours of the Spine.—These may arise in the bony wall or in the nerve elements or in their coverings.

Carcinoma, Sarcoma, Glioma, &c., may develop as a direct sequence of injury, or injury may determine the rapid growth of a developing metastasis. (*See* **Cancer. Brain, Tumours of**).

Spinal Meningitis.—The covering of the spinal cord may be damaged by fractures and dislocations, but this is usually masked by the more severe associated injuries to the cord itself or its nerves. If the dura mater is opened by a wound there is a great risk of the entry of septic material, and death from septic meningitis.

Chronic Spinal Pachymeningitis may follow injuries, such as strains, wrenches, &c., in syphilitics or alcoholics ; in this there is thickening of the dura (the outer and thickest covering of the cord next the bony case), and adhesions of the structures to the bone, and there may follow contraction of the thickened dura and slow compression of the nerve elements, with consequent paralysis and degeneration of muscles and total incapacity.

SPINAL ACCESSORY NERVE is deeply placed in the neck at its beginning, but becomes more superficial towards the termination. This nerve has two roots of origin : the accessory part comes from the lateral tract of the medulla, below the pneumogastric nerve, and the spinal part from the cord as low as the fifth cervical ; the accessory part becomes joined to the vagus. The spinal part passes up into the skull through the foramen magnum, and issues from it with the vagus through the jugular foramen, and comes down the neck again between the internal carotid artery and internal jugular vein and supplies the sternomastoid and trapezius muscles. Section of this nerve causes paralysis of the sternomastoid and trapezius muscles and paralytic wry-neck follows; irritation of the nerve may cause spasmodic wry-neck. Sometimes the trapezius muscles receive an additional nerve supply from the cervical nerves, and if this is so, the incapacity after section will not be so great; but if both sternomastoid and trapezius muscles are completely paralysed there will be loss of power for lifting weights, and inability to raise the arm above the level of the shoulder. If the severed nerve can be sutured soon after the injury a good result may be hoped for, otherwise there will be permanent atrophy of the muscles. (*See* **Neck.**)

SPLEEN.—A large ductless gland situated in the upper part of the abdomen on the left side, partly under cover of the ribs and abdominal wall in front (left hypochondrium and epigastrium). It is applied to the stomach, tail of the pancreas and left kidney, and is separated from the ninth, tenth and eleventh ribs and pleura by the diaphragm. The functions of this organ are not well understood; it is believed to have something to do with the breaking up of red blood-cells, and the formation of hæmoglobin. (*See* **Blood.**) Injuries to the left side of the abdomen, such as contusions, crushes, &c., may cause rupture or hæmorrhage into the substance of the spleen, an inflammation of its capsule, and the formation of adhesions (perisplenitis) abscess, gangrene, rupture. The spleen becomes enlarged in the course of certain diseases, such as leucæmia, malaria, typhoid fever (q.v.). In chronic enlargement of the spleen, which is common in persons who have suffered from malaria, the organ may be readily injured by effort, strain, contusion, &c. Cysts are also found in it, and they may be ruptured by trauma and serious internal hæmorrhage follow.

Wandering Spleen (Movable Spleen).—This is an acquired condition, which is much more frequently met with in women than in men. It may occur after a fall (Tillmans), or it may be the result of an enlargement, or its origin may be quite obscure and have no relation to trauma. When once it leaves its position it may travel to any part of the abdominal cavity, thus causing a long pedicle to form, which may permit of sudden twisting and consequent strangulation and gangrene.

Douglas records a case of torsion of the pedicle from which the patient died in six hours. The torsion may be slow, and thus cause a gradual atrophy of the organ. The displaced spleen may become adherent to the intestines, and cause intestinal obstruction. Ordinarily, a wandering spleen may not cause any symptoms. If it becomes strangulated, operation is imperative.

Rupture of the Spleen will require immediate operation to save life. The other conditions following injury are extremely dangerous, and usually fatal. The spleen has been known to have escaped through a wound in the abdominal wall and remain outside for months as a foul, bleeding mass (Kelly and Noble).

The general mortality for all wounds of the spleen is placed at 70 per cent.; the mortality for the operation of **splenectomy** for rupture of the spleen is, according to Warren, cited by Douglas, 41.2 per cent. After recovery from the operation of removal of the spleen, patients seem to enjoy good health, and appear to get on quite well without the organ. No doubt many patients will be able to do a considerable amount of work in about twelve months after the operation of splenectomy, provided the abdominal wound is sound, and not likely to result in a ventral hernia. (*See* **Leucæmia.**)

SPRAIN is the straining or wrenching of a joint. It is frequently associated with fractures, as in the term "sprain fracture," in which a piece of bone may be torn off, with a displaced or lacerated tendon. It usually takes several weeks before full functional recovery ensues.

Riders' Sprain is a sprain of the muscles (adductor longus) on the inner side of the thigh, which sometimes results from horseback riding. It is troublesome to treat, and frequently recurs.

A Strain is a term applied to a painful condition of a joint or a muscle which has been over-exercised or pulled on. It may be accompanied by minute tears and small hæmorrhages.

A sprain may be, to a large extent, the result of a strain. (*See* **Muscle.**)

STOMACH.—The food receptacle below the gullet. It is situated in the upper abdomen, and is made up of four coats: (1) the outer peritoneal or serous; (2) the muscular; (3) the submucous; (4) the inner or mucous. That portion of the stomach which is connected with the gullet is called the cardiac end, and the end nearest the bowel (duodenum) is called the pyloric end. From the lower border hangs down the gastro-colic or great omentum, containing the transverse part of the large bowel (transverse colon).

The stomach may be injured by penetrating wounds of the abdomen, by blows, kicks, or crushes, &c., involving the abdominal walls; efforts, as in lifting heavy weights, &c. If the organ is full at the time of the accident there is much greater liability to damage than when it is empty. The serious results which may follow injury are dependent on the extent of the rent in the wall, the rupture of a blood-vessel, and the resulting hæmatemesis (q.v.), or on the nature and character of the peritonitis (q.v.) excited.

This peritonitis may be plastic or adhesive, and seal up a small rent completely, or the stomach contents may come sooner or later into contact with the plastic material, and infection with softening result, subsequent extravasation, general septic peritonitis and death. This plastic or adhesive peritonitis, if it cure the rent, generally forms strong bands of adhesion to other neighbouring parts; these may drag or pull on the organs, causing pain and interference with function, and incapacity ensues. The adhesion may fix the stomach to the abdominal wall, and, as a consequence of infection from within, an **abscess** may form and burst externally, leaving a **gastric fistula**, which may require a severe operation for its cure. The rent may be so extensive that the septic contents of the stomach are poured at once into the abdominal cavity, and death follows from septic peritonitis, unless the patient can be rescued by an immediate operation.

Stenosis or Contraction of the Pyloric end of the stomach may follow trauma and the formation of adhesions, or originate in a traumatic ulcer, which can produce severe symptoms in itself, or the ulcer having healed, cicatricial contraction may ensue. The traumatic origin of stenosis may be admitted if the characteristic symptoms follow symptoms of injury to the stomach in a period varying from fifteen days to three years (Sand). This stenosis may delay or prevent the exit of food into the intestine, the result being dilatation of the stomach, with its train of symptoms—pain, vomiting, emaciation, &c.

Pyloric stenosis may, in suitable cases, be relieved by the operation of **gastro-jejunostomy**, which consists in making a new opening between the stomach and intestines. The mortality of this operation for simple gastric ulcer (not for ulcers with recurrent, severe hæmorrhage), or for pyloric stenosis or other sequelæ, should certainly be under 3 per cent. in the hands of surgeons of average skill (Jacobson).

Some of my patients have been able to return to fairly hard physical work in about twelve months after the operation.

Injuries to the abdomen may cause, in addition to the conditions before mentioned, a

Rupture or a separation of the mucous membrane. This will give rise to symptoms of shock, pain and hæmatemesis (q.v.), which may be fatal, or the patient may survive these immediate dangers and become the subject of a gastric ulcer.

Traumatic ulcer of the stomach shows itself in two forms, the acute and the chronic. The acute form follows the injury rapidly, and is really a persistence of the early symptoms of injury. The course is mostly favourable. As a general rule, a wound of the mucous membrane of the stomach heals readily (Robson), but there is some danger that the floor of the ulcer may give way, and a septic peritonitis result ; or the ulcer may pass gradually into the chronic class. Chronic ulcer of traumatic origin arises, in the majority of cases, as a matter of slow evolution. The symptoms of ulcer succeed without change to those of injury to the stomach. There are, however, certain atypical cases cited by Thoinot in which there has been a clear interval between the injury and the onset of the symptoms. In the case of Wittneben, the primary symptoms of injury ceased, but reappeared in a month. In that of Rendu there was an abundant hæmatemesis ; this ceased, but in three weeks the patient began to suffer from pain after food, vomiting, bringing up a little blood occasionally, there was wasting and anæmia.. He left hospital relieved but not cured. In the case of Gallard, a man four years previously had received a violent blow on the epigastrum. Hæmatemesis followed ; this subsided for a month, and then recurred with all the signs and symptoms of gastric ulcer. In the *B.M. J.*, 10th July, 1909, there is a short record of the experiments of Gibelli, undertaken to determine the possibility of ulcer of the stomach being caused by injury to the outside of the abdomen. The results were negative, but the conditions of the experiments differed from those which occur in human beings. Yet they give support to the theory that gastric ulcer is hardly likely to result from an external injury. Osler noted a history of trauma in seven cases.

The surgical treatment for gastric ulcer is by the operation of gastro-jejunostomy or excision. Many cases are relieved and some cured by prolonged medical treatment.

The vast majority of cases of gastritis, gastric ulcer, duodenal ulcer, and pyloric stenosis arise from other causes than trauma, so that in forming an opinion the personal history is highly important, as there will be in inveterate cases nearly always an account of antecedent symptoms referable to the stomach. A patient, the subject of an old-standing ulcer in the stomach or duodenum, may suffer rupture of the ulcer by contusions, blows, crushes, &c.; by lifting a heavy weight, by effort or strain.

Similar violence, while it may not cause rupture, may excite an attack of hæmatemesis which may be fatal. The presence of these ulcers is always a serious matter, though they sometimes exist without producing more symptoms than what the patient calls indigestion.

Carcinoma of the stomach.—Cancer may develop at the site of an ulcer, and as the disease is one frequently met with without any history of injury, it is necessary before accepting trauma as a cause that there should be distinct symptoms referable to the trauma. As the cancer develops slowly, these symptoms would persist during the evolution of the disorder, and become severe when the cancer becomes capable of being diagnosed. (*See* **Cancer.**)

SUBLUXATION.—A partial or an incomplete dislocation (q.v.). The condition falls short of complete separation of the articular ends of the bones of a joint (q.v.). Its results depend on the amount of synovitis or arthritis which follow, and also the extent to which the ligaments are torn. There very frequently follows a weak and unstable joint, especially if complete reduction cannot be effected, or if there is difficulty in retaining the displaced bone.

SUBSTITUTION.—The allegation that a diseased condition arising from natural causes or a pre-existing disease, defect or deformity is due to a particular injury. The notion that the presence of a morbid condition in an individual may become a useful and possibly valuable possession is one which occasionally does service as the basis of a claim for damages or compensation. Such an idea is, perhaps, not infrequently inspired by the sometimes too generous findings of those twelve tender-hearted and true men who are so regularly called upon to investigate judicially the litigious obsessions of their fellow-citizens. It may also take its origin in the hope that it may be the means of achieving a period of pensioned rest from labour, or that it may even anticipate by some years the realisation of the epoch of " blest retirement, friend to life's decline."

If such a basis for the claim could be proved, and if at the same time it were found that there was either no accident at all, or a previous accident having no relation to the one at issue, then the question as to the extent to which the whole matter was fraudulent substitution would, no doubt, be solved by the judicial tribunal and dealt with accordingly.

Another form of substitution is met with which can hardly be classed as imposture, for the subject fully believes in the relationship between cause and effect, though really as far as medical science goes such a connection cannot exist. This has been termed unconscious substitution. An example may assist in making it clear. A man has a fracture of the middle of the radius, caused by a weight falling on the forearm. This unites well, and he resumes his occupation in three months. Nine months after his return to work he consults his doctor for what he believes to be piles. On examination the condition is recognised as incipient, malignant disease. The man firmly believes that the injury to his arm is the primary cause of his ill-health, while as a matter of scientific knowledge this cannot be true.

It will be seen that great importance must be attached to the investigation of the previous personal history of an injured person, if there are any reasons for believing that the injury is not what might be expected, having regard to the nature, circumstances and date of the accident. The investigation may often be one of much difficulty, and for that reason many insurance companies who undertake this class of risk feel that there is a good case for urging employers of labour to institute a physical examination of all candidates for employment.

The effect of such a proceeding, if rigorously adopted in the industrial world, would, no doubt, be to throw numbers of workmen out of employment, who would be added to the ranks of the unemployed and unemployable. These people cannot be left to starve, and must claim to be provided for by the State, yet they cannot be interminably supported in idleness. The difficult problem of the conditions under which these invalid workers are to be re-admitted to the industrial army is one which the legislature will have to deal with at no very distant date. (*See* **Exaggeration. Malingering. Provocation.**)

SUTURE.—A surgical term applied to the sewing up of wounds, severed muscles, nerves, tendons, fractured bones, &c.

Primary Suture means sewing up of the wounded parts soon after the injury.

Secondary Suture means sewing up of the severed parts days, weeks or months after the original injury.

The word suture is also used in an anatomical sense in connection with the seams or lines of junction between the bones of the skull and face.

SYMPATHETIC NERVE.—The large gangliated nerve trunks and their plexuses. They are placed deeply on each side of the vertebral column, and extend its full length. Their minute branches are distributed to the thoracic and abdominal organs, to the dilator of the pupil, and the glands of the skin. The function of the nerves is believed to be that of augmenting the heart beats, influencing the secretion of glands and trophic processes, and the supply of blood to the various parts of the body.

They act automatically, and are beyond the control of the individual.

Seeligmuller, cited by Tillmans, has collected thirteen cases of injury to the cervical sympathetic. The symptoms of paralysis are contraction of the pupil, narrowing of the fissure between the eyelids, redness of the face, increased flow of tears. Irritation of the nerve causes dilatation of the pupil and rapid heart beat. The nerve may be paralysed by a stab, gunshot wound, or an injury to the neck, and irritated in fractures of the clavicle. It may also be affected indirectly in injuries to the brachial plexus (q.v.).

In case of irritation of the nerve alone there will be little incapacity. If the nerve is paralysed the excessive secretion of tears and the alteration in the pupil may cause an amount of disability.

SYNOVITIS.—An acute or chronic inflammation of the synovial or lining membrane of a joint. It is a painful affection, characterised by swelling and fluctuation as a consequence of the effusion of fluid into the joint. This condition very frequently follows injury, but it may arise in the course of various diseases, such as rheumatic fever, &c.

It may be simple or septic. The simple follows blows, sprains, wrenches, dislocations, fractures ; the septic is a result of the septic infection of a penetrating wound, compound dislocation or fracture. It may end in general septicæmia, or require amputation or excision. If these dangers are escaped, there nearly always is a certain amount of anchylosis (q.v.).

The simple form may resolve and full use of the joint return, or there may follow adhesions and anchylosis, loose bodies in the joint, loose cartilages, relaxed joint, atrophy of muscle, tuberculous synovitis or arthritis, arthritis deformans or chronic synovitis.

Chronic synovitis frequently follows the acute form. The synovial membrane becomes thickened as the result of a slight form of inflammation, and there is a small amount of fluid present. This form will probably cause permanent damage to the delicate structures of the joint, weakness of the limb, with relaxed ligaments. The incapacity will be localised to the affected limb. (*See* **Arthritis.** For tuberculous disease, *see* **Joint.**)

SYPHILIS. (*See* **Chancre.**)

SYRINGOMYELIA and HÆMATOMYELIA.—A disease of the spinal cord, characterised by the presence of hæmorrhages, softening and the formation of cavities, and the consequent destruction of the delicate nerve structures. Syringomyelia is believed to be dependent on (1) some developmental defect; (2) the formation of new glia tissue (the neuroglia or supporting tissue of nerve structures), followed by the degeneration of the walls of the blood-vessels and consequent hæmorrhages; (3) an inflammation and the formation of thrombi; (4) the obstruction to vessels and lymph channels caused by a tumour, compression of the cord, curvatures of the spinal column, pachymeningitis and adhesions.

In the matter of the ætiology of the condition, according to Hektoen and Riesman trauma seems to occupy an important position in an indirect way; manual labour and the male sex are also factors in the causation.

Thoinot states that the position is that trauma of the spine may create or aggravate syringomyelia.

In syringomyelia the onset is slow and gradual. There are aching pains in the neck and arms, wasting of muscles of hands and arms, twitchings, partial reaction of degeneration; anæsthesia of the hands and arms to temperature and pain, but not to touch; unequal pupils; the legs become paralysed late; scoliotic curvature of the spine; eruption on and dryness of the skin; ulcerations, painless whitlows, spontaneous fractures. The prognosis is very bad, but the disease may last for from five to twenty years, and when established there is total, permanent incapacity.

Kurt Mendel thinks that injury can neither incite nor directly cause syringomyelia in healthy persons. The theory advanced by Minor, and quoted by Thoinot and others, has supporters. It is that the trauma causes an injury, and the subsequent hæmorrhage (hæmatomyelia) becomes the point of departure from the normal, and an inflammatory reaction with overgrowth of neuroglia takes place. There ensues a gliosis on which a syringomyelia develops. The aggravation of syringomyelia by injury will be readily admitted.

As to symptoms, those of hæmatomyelia will be immediate: for an hour or two numbness, then paraplegia, anæsthesia, perhaps loss of consciousness; reflexes absent at first, they return later, and may be exaggerated; if high up in the cord, the arms may also be paralysed. The symptoms may subside in about a fortnight, and myelitis, or the condition akin to syringomyelia, follow. The prognosis is serious, but recovery may take place, and the subject be able to return to work in time.

On the point of origination of syringomyelia, two modes may be considered: (*a*) that the disease may follow a peripheral injury—one which does not directly attack the cord, the disease arising by extension upwards of an infection from a septic wound, say, in the hand; (*b*) it succeeds to a spinal injury.

Thoinot thinks that the origin in this first manner is not yet proved. The second mode of origin (*b*) by direct injury to the cord, is much better supported by clinical evidence; the trauma is such as causes damage to the spinal column, *i.e.* falls on the back, blows by heavy weights, &c.

Bailey thinks that an injury to the cord causing hæmatomyelia (hæmorrhage into the cord) may occur without there being any discoverable damage to the bones, and symptoms similar to syringomyelia may follow, but that the condition is entirely distinct from the chronic, probably congenital, disease known as syringomyelia.

A cavity in the cord, formed after the absorption of blood, in cases of hæmatomyelia, is called by Van Gieson **hæmatomyelopore.** These cavities are not surrounded by epithelium, but by more or less healthy tissue, and are not usually connected with the central canal of the cord, as in syringomyelia. (*See* **Hæmatomyelia.**)

TALIPES (Club Foot).—This deformed or abnormal position of the foot is most frequently of congenital origin, but it may be acquired. As an acquired deformity it may follow paralysis of certain muscles, and be a result of the action of unopposed healthy muscles ; it may follow burns and the subsequent contraction of scar tissue ; it may be a result of fractures and injuries to joints, ruptured tendons, injuries to nerves.

Names are given to the condition according to the position the foot assumes—Equinus : the toes point down, foot over extended, and the heel up ; varus : the sole looks in, foot adducted ; calcaneus : the toes point up, the heel down ; valgus : toes point out, sole looks out, and the foot is abducted. These distortions may be found arranged in various combinations, and they usually produce considerable disability in the full use of the foot. (*See* **Foot.**)

Pes Planus (Flat Foot). (*See* **Foot.**)

Pes Cavus, or **Talipes Arcuatus.**—Hollow foot is very rarely of traumatic origin, but may be a result of fractures or crushes of the foot. The disability in these conditions is due to the difficulty in walking and pain. The prognosis depends on the nature and extent of the injury and displacement. A radiograph will give a great amount of information, and assist in forming an opinion.

TAR. (*See* **Epithelioma. Cancer. Pitch.**)

TARSUS. (*See* **Foot.**).—The tarsus consists of seven bones which make up the instep. The word tarsus is also used to apply to the connective tissue frame of the eyelid.

TELEGRAPHISTS' CRAMP.—A form of fatigue spasm which affects telegraph operators who use the Morse instrument. It is characterised by spasm of the muscles of the thumb and hand, tremor, pain, weakness; there is no wasting or paralysis; the disease is a functional neurosis. The condition is associated with the use of the Morse key in sending, and it is demonstrated objectively on the recording slip by irregular spacing and illegibility in the message. When the disease is established there is a very great liability on the part of the operator to send incorrect messages by reason of the spasm and weakness, causing want of accuracy in the manipulation of the key. The result of this is that the dots and dashes of the Morse alphabet may be read in a different sense to what was intended, and thus serious mistakes ensue.

That the errors are not due to carelessness on the part of the operator is shown by the fact that the same fault repeatedly occurs at the same place. The disease is specific to the employment, and makes its appearance in the most expert officers.

From the evidence before the Departmental Committee on Industrial Diseases, it appears that about 2.75 per cent. of the total staff employed in telegraphy is affected with the disease. The condition when established incapacitates from the special employment with the Morse key, but it is found that sufferers can quite readily use the Hughes instrument. Both hands may become involved, and the cramp may occasionally develop into writers' cramp (q.v.), and cause additional incapacity. It may recur even after long periods of rest.

Telegraphists' cramp is scheduled as an industrial disease, but it differs from the other scheduled diseases in that the Postal Medical Officer is substituted for the Certifying Surgeon (in Post Office employés only) as the person who gives the medical certificate if a claim for compensation is made. There remains the appeal to the Medical Referee if either party feels aggrieved by the Postal Medical Officer's opinion.

TENDON.—The cord-like termination of a muscle. Tendons frequently run in grooves or sheaths, and these may be lined with synovial membrane like a joint, to lessen friction and facilitate movements. Injuries may cause rupture, contusion, crushing. If healing takes place without suppuration there may be a good return of function, but if the tendon sloughs or suppuration supervenes in the sheath after an injury, there will be permanent disability. If rupture of a tendon can be treated by suture, and this is carried out early, before there is much separation of torn ends or atrophy of the muscle, the result may be good, and functional power restored.

Dislocation of a Tendon from its groove or sheath may, by the loss of action of the tendon, cause considerable weakness in a limb. (*See* **Biceps. Foot. Shoulder.**)

Rupture of the Plantaris Tendon may occur from straining, wrestling, tennis playing, &c. It is signalised by a sharp stinging pain in the calf. Recovery is usually complete after two weeks' rest.

Tenosynovitis, or inflammation of the synovial lining of tendon sheaths, may ensue after injuries such as contusions, &c., and it may be an accompaniment of fracture. It may also follow repeated slight traumatisms such as occurs to miners from the jarring of the wrist, caused by using the pick. In mining the synovial membrane of the wrist-joint is affected as well as the tendons. The condition causes incapacity for work, and requires early treatment. It is very likely to recur. The acute stage generally lasts for about a fortnight ; it may get quite well, or become chronic and prevent a collier from following his occupation. If the disorder becomes chronic there may follow adhesions of the tendons to their sheaths, and consequent limitation of movements in the wrist-joint. The condition is recognised by swelling of the sheaths, by pain on movement and the creaking sensation which occurs when a hand is placed over the part affected. The disease as it affects the wrist in regard to the occupation of a miner is scheduled under the name of **Inflammation of the Synovial Lining of Wrist-Joint and Tendon Sheaths.** (*See* **Carpus.**)

Tenosynovitis may affect the tendon sheaths about the ankle-joint, and cause incapacity, and if it becomes chronic anchylosis (q.v.) may result. (*See* **Ankle.**) Some tendon sheaths have a direct communication with the neighbouring joint (the popliteus with the knee, the biceps with the shoulder), and inflammation may spread from one to the other.

Tuberculous tenosynovitis occurs occasionally as a primary affection. It may follow injury in a subject affected with tuberculous disease elsewhere, or arise by extension from diseased joints or bones. If recognised early, excision may give relief from the disease, and the functional result will depend on the amount removed, and the importance of the tendon. (*See* **Bursa. Ganglion.**)

TENTH NERVE (Pneumogastric Nerve, Vagus Nerve).—It comes from the floor of the fourth ventricle of the brain, and appears in the medulla in the sulcus between the restiform and olivary bodies, and passes from the skull through the jugular foramen in the same sheath, with the spinal accessory nerve.

It is a nerve of sensation and motion, and supplies the heart, lungs, æsophagus, stomach, ear, larynx, and pharynx. This nerve is rarely injured alone. If one side only is injured above the origin of the recurrent branch, pneumonia, difficulty in swallowing and hoarseness may follow ; if both are severed death will follow from paralysis of the glottis (the aperture between the vocal cords, concerned in voice production and the admission of air into the lungs), pneumonia. If one nerve is severed below the recurrent laryngeal, no ill-effects, as a rule, follow. The nerve may be sutured after injury, or if this is not possible a junction may be effected with the cervical or spinal accessory nerves (Sherren).

TESTICLES (the Seminiferous Glands).—They are suspended in and enclosed by the scrotum, are ovoid in shape, and from the lower end proceeds the *vas deferens* or duct. Each gland has a covering originally derived from the peritoneum, called the tunica vaginalis ; this is reflected over the inner wall of the scrotum, and forms the sac in which a hydrocele (q.v.) develops. The epididymis is an oblong body consisting of a mass of tubules intimately connected with the upper and back part of the testicle.

Contusions of the scrotum may involve the testicle in damage. Slight injuries may be readily recovered from ; if severe, they usually cause a considerable amount of shock, which has been known to end fatally. Blows on the testicles are sometimes followed by intense neuralgic pains, or even incontinence of urine, and later mental degeneration. If the testicle is badly crushed it will require removal.

Hydrocele may follow and cause temporary incapacity, and if the injury has been severe there may be **rupture of the tunica vaginalis** at its vascular junction with the testicle and extensive bleeding may occur, causing the scrotum to swell up to a very great size. In such a case under my own care immediate operation and arrest of hæmorrhage was successful. A less severe form of hæmatocle (blood in the tunica vaginalis or spermatic cord) may follow injury or effort. It is amenable to surgical treatment, and full recovery may follow in about six or eight weeks. (*See* **Hæmatocele.**)

Orchitis.—Inflammation of the testicle. Inflammation of the epididymis, epididymitis. This may follow direct injury from a blow, contusion, &c., or be a complication of mumps, rheumatism, malaria, &c. It is a common complication of gonorrhœa (q.v.), and in such cases an examination of the discharge from the urethra will show the presence of the gonococcus. Epididymitis or orchitis generally appears during the second week of the disease. The fact that a non-gonorrhœal discharge from the urethra is extremely rare, and the positive evidence of a profuse discharge containing gonococci will settle the question of diagnosis as between gonorrhœal and traumatic orchitis.

Most inflammations of the testicle and epididymis subside in about four weeks. In severe cases atrophy or suppuration, and even destruction of the gland may follow. This atrophy may ensue after slight blows (Watson), The disease may assume a chronic form, and the gland remain enlarged, or there may be the formation of a discharging sinus.

Gangrene of the testicle may follow torsion of the spermatic cord (q.v.), or injury to it causing thrombosis, or this thrombosis may be of idiopathic origin, having no relation to trauma.

Orchitis by effort or strain is a condition which may rarely occur. If due to this cause there would be very sharp pain at the moment of injury, with fainting, and the inflammation would appear within three days. There should be no acute gonorrhœal urethritis, though, of course, such an injury may occur in a person the subject of gonorrhœa.

The mechanism of orchitis by effort is explained by Tillaux, English and others: that during the lifting of a heavy weight the effort causes increase of the intra-abdominal tension, and the cremaster muscle may contract, violently compressing the testicle against the external inguinal ring and pubes. Sebileau and many authorities contest this view, holding that such a disease as "l'orchitis par effort" does not exist. They think that there is some latent gonococcal or tuberculous infection, and that the injury brings into prominence a latent or ignored disease. Lenoir also holds the opinion that effort alone cannot create an epididymitis or an orchitis, but that it may play a part in exciting inflammation in organs that are either infected or diseased. However correct this may be, it is certain that an injury, either direct or by effort, sufficient to develop an orchitis will be followed at once by pain of a severe kind, possibly an attack of syncope, and immediate incapacity for further work for some weeks.

Tuberculous Orchitis and Epididymitis are diseases which may appear as a part of urogenital tuberculosis, or they may very rarely be primary, there being generally a tuberculous focus in some other part of the system. The epididymis is usually affected first, and the testicle secondarily. Direct injury or effort may readily act as a predisposing or exciting cause, but as this disease is slow in its evolution the characteristic signs and symptoms may not appear until several weeks after the injury. It is a serious condition, and death may ensue from general tuberculosis, or tuberculous disease of the bladder or kidneys. If it is localised only in the testicle, early removal may prevent systemic infection.

Syphilitic Orchitis and Epididymitis.—In this the testicle is first invaded, and, as a rule, only in the later stages of syphilis. The enlarged gland is hard and painless, and the condition has no relation to trauma.

Cancer of the testicle may be excited, accelerated, or aggravated by direct injury or effort. Kober found a history of trauma in 43 per cent. of sarcomas (Watson). (*See* **Cancer.**)

Dislocation of the testicle is a rare injury. According to Bruns, the displacement may be on the pubes, inner side of thigh, perineum, or up into the inguinal canal. The organ may be so damaged as to require removal; in less severe cases manipulation may reduce it, but an operation may be necessary to retain it in the normal position. This will be generally successful.

An **Undescended Testicle** which becomes located in the inguinal canal is very liable to injuries. This condition shows a great tendency to the development of malignancy apart from any definite trauma, but if injury occurs it may very well be the exciting cause of a cancerous or sarcomatous growth.

Loss of one testicle, if the other is healthy, is not a very serious matter, nor does it cause any incapacity for work beyond the month or six weeks required for healing of the surgical wound.

Loss of both testicles does not in itself involve the working capacity, but is very frequently followed by mental symptoms which may produce total incapacity.

TETANUS (Lock-jaw).—An acute disease which is due to the invasion of an abrasion or wound by the *Bacillus tetani*. The bacillus is found in soil, refuse, &c., therefore wounds that are begrimed with earth, &c., are very liable to be followed by tetanus. The disease is characterised by spasmodic contractions of the muscles of the jaw, neck and back, with excruciating pains. The period of incubation is usually some days, but the signs of the disease may appear within a few hours of injury, this largely depending on the number of bacilli present in the infecting dirt. The affection is a very serious one ; not less than 75 per cent. of all the cases prove fatal (Fowler). If the patient survives beyond the fourteenth day of the illness full recovery may eventually take place.

THIRD NERVE.—This nerve comes from the inner side of crus cerebri in front of pons, and passes forward, entering the orbit through the sphenoidal fissure to supply all the muscles of the eyeball with the exception of the superior oblique, external rectus, and orbicularis palpebrarum. Paralysis of this nerve may arise from syphilis, exposure to cold, meningitis, diphtheria, growths involving the nerve, chronic disease of the nervous system, fractures of the base of the skull. The whole nerve is rarely affected, one or more branches usually escaping.

Complete division of the nerve causes drooping of the eyelid (ptosis), dilatation of the pupil, external squint, double vision. The prognosis will depend on the cause and the extent to which the nerve is damaged. A simple neuritis may get quite well.

THORAX (The Chest).—The bony cage containing the lungs, heart, great vessels and nerves. It is formed by the junction of the twelve ribs on each side in front with the sternum or breast bone, and behind with the twelve dorsal vertebræ.

The Sternum or breast bone is a long, narrow, flat bone, situated in front between the anterior ends to the ribs and collar bones. **Fractures or dislocations** of this bone alone are extremely rare. An injury of such violence as to cause fracture or dislocation will usually cause other severe internal injuries, which are frequently fatal. If there can be reduction and apposition of the ends affected, union will be complete mostly in about eight weeks ; after this time a support is required for two or three months to prevent the yielding of the newly-formed callus or recurrence of the dislocation. If the fractured ends cannot be reduced in the ordinary way, and there are symptoms of pressure, cyanosis, &c., a serious operation may be required. (*See also* **Aorta. Asphyxia. Concussion. Heart. Lung. Pleura.**)

THORACIC DUCT. (*See* **Chylothorax.**)

THROMBOSIS. (*See* **Embolism.**)

TIBIA and FIBULA.—The tibia is the inner and larger bone of the two in the leg. The upper end enters into the formation of the knee, and the lower into the ankle-joint. On its outer side it has in contact above and below, the small bone of the leg, the fibula.

Fractures near the upper end may involve the knee-joint (q.v.), and cause anchylosis, or the vessels in the popliteal space may be damaged or the peroneal nerve (q.v.) involved.

At the lower end the ankle-joint (q.v.) may be implicated in the fracture. Both tibia and fibula may be fractured, either singly or together, in any part of their course ; if both bones are broken there is greater difficulty in producing a good anatomical cure, and there may be overlapping and consequent shortening ; if only one of the bones is broken the other acts as a splint, and the shortening and deformity is usually much less.

Simple fractures not near the joints frequently recover with full functional activity. Compound fractures or fractures with comminution take a long time to recover, and there may result deformity and disability ; in severe cases amputation may be necessary.

Fractures of the shaft of the fibula are often obscure, and difficult to diagnose without a radiograph. They usually unite well, but near the upper end the callus may grasp the peroneal nerve. Delayed or non-union may occur and require operative suture. (*See also* **Ankle. Femur. Knee. Lower Limb.**)

TROPHIC.—Relating or pertaining to nutrition. The trophic centre is the nerve centre, which controls, regulates or influences the nutrition of a part. **A trophic Sore** is one which occurs on a part whose nutrition is interfered with by the action of injury or disease causing diminished or altered nerve influence.

TUBERCULOSIS.—A disease consequent on invasion by the *Bacillus of Koch.* Direct infection may occur by the introduction of the germs into a wound or abrasion of the skin, or there may be inoculation from the handling of infected carcases and hides, and handkerchiefs contaminated with tuberculous sputum. Local manifestations of the disorder will then appear, and there may also be general systemic disease, which may show itself in the brain, lungs, pleura, peritoneum, &c. Injury may excite the more rapid development of a pre-existing focus, or, more rarely, it may determine the localisation of bacilli which have already entered into the system. Severe injuries may indirectly contribute to the evolution of tuberculosis by depreciating the general health and consequent diminution of the natural resisting forces of the body, with greater liability to infection.

The germs may enter the system by the inhalation of infected dust, or by being introduced into the body in the food, and sooner or later give evidence of their presence in the lungs or other organs.

In some situations the localised disease may be removed by operation, and good results obtained. If the internal organs are attacked prolonged incapacity for severe, physical labour will ensue. The disease frequently ends in death. (*See* **Bone. Joint. Phthisis. Pleura. Peritoneum. Testicle.**)

Lupus Vulgaris, Tuberculosis Verrucosa, Scrofuloderma are all forms of tuberculosis of the skin, which may have occurred from direct infection. This disease may also result from indirect inoculation of the skin with secretion from deep-seated tuberculous lesions, and may be traced along the lymphatics leading from a focus in bone or glands, the intervening tissues being unaffected (Hektoen and Riesman). According to these authors, the proportion of tuberculous skin diseases in which phthisis is also present varies from 10 to 60 per cent.

TYPHOID FEVER.—A disease due to infection by the *Bacillus typhosus.* The period of incubation varies from eight to twenty-three days. The onset is usually gradual, but may be occasionally sudden. The disease lasts for twenty-eight to forty-two days or longer. It may be contracted by the drinking of contaminated water or food, or by falling into infected water and some of this being swallowed. Infected dust may be inhaled, or it may pollute food. The stools of persons who have had the disease years before may retain infection (typhoid carriers).

ULCER. A Sore.—A solution of continuity in the soft parts with loss of substance. Ulcers are spoken of as healthy, healing or granulating; weak or fungous; indolent or indurated and non-granulating; irritable or red, tender, painful; inflamed or swollen and discharging freely; specific, or due to a specific disease such as syphilis; varicose, or due to varicose veins.

Ulcers may readily follow injuries, and if they are not extensive, or there is not a great loss of substance, healing will take place without any disability. In the alternative event there may be delay in healing, and the resulting scar, cicatrix (q.v.), may be adherent to structures underneath, or it may contract and cause limitation in the movements of muscles or joints, or it may develop keloid (q.v.).

A varicose ulcer may be caused by slight injury in a person the subject of varicose veins (q.v.). The chronic congestion often accompanied by an eczematous condition of the skin in the neighbourhood of old-standing varicose veins renders it very liable to abrasions and the consequent formation of ulcers. These ulcers are very difficult to heal on account of the unhealthy condition of the parts, and prolonged rest and treatment, even for months, is frequently required. When they do heal, in order to prevent relapse, it is necessary that some form of support should be worn, not only to assist the circulation of the part, but as a direct protection from injury.

Any damage to .the scar is very prone to cause recurrence, and a further period of incapacity. These ulcers are also found in persons with varicose veins who have not received any injury, being due to the natural tendency of the congested parts to break down into ulceration. (*See* **Varicose Veins.**)

ULNA.—The bone of the forearm situated on the little finger side. Fractures of this bone may occur at any part. The olecranon process, which forms the tip of the elbow, is especially liable to fracture; this frequently involves the elbow-joint (q.v.), and if the fracture is compound, it may result in anchylosis. Union in simple cases is usually complete in four weeks, and the movements of the elbow-joint will be normal in about three months; the union is often fibrous rather than bony, but it may be quite as efficient as bony union. If there is non-union or a wide separation of the fragments operative suture may be necessary.

Simple fractures of the shaft generally unite well with little displacement, as the sound radius acts as a splint.

Fractures of a portion of the coronoid process are an accompaniment of dislocation of the ulna backwards, they usually do not cause any disability after reduction of the dislocation; but if the whole of the coronoid is broken off there may follow relaxation and atrophy of the brachialis anticus muscle or anchylosis of the elbow. (*See* **Elbow.**)

Fractures of the lower end are not so frequent as in the radius. The styloid process is often fractured in association with fracture of the lower end of the radius (Colles' Fracture, q.v.), good functional results generally follow treatment.

Dislocations of the ulna are dislocations involving the elbow and wrist joints. (*See* **Elbow. Carpus. Wrist. Radius.**)

Non-union may occur after fractures and require operative treatment.

Compound fractures or dislocations may result in serious disability and deformity; nerves may become involved and muscles or tendons become adherent, and there may result incurable paralysis or permanent limitation of the movements of the hand and fingers. For fractures of both bones (radius and ulna) *see* **Upper Limb.**

ULNAR NERVE.—This nerve comes from the inner cord of the brachial plexus (q.v.), passes to the inner side of the axillary and brachial arteries, then down to the groove between the olecranon process of the ulna and internal condyle of the humerus; the nerve is here very superficial, and is popularly known as the " funny bone." It passes on to the forearm under cover of the flexor carpi ulnaris muscle, becomes more superficial at the front of the wrist, and supplies branches to the skin of the middle of the forearm, palm and both sides of the little finger, and the adjacent side of the ring finger. It supplies muscular branches to the flexor carpi ulnaris and half of the flexor profundus digitorum, the interossei and the two inner lumbricales; it also supplies the adductor and the short flexor of the thumb. The nerve may be injured in any part of its course by wrenches, contusions, fractures, dislocations, wounds; it may be displaced from its groove and require operative fixation, or it may be involved in scar tissue or callus. These injuries may cause weakness in flexing the wrist; the paralysis of the interossei may cause loss of the movements of the fingers required in writing, the muscles atrophy, and there appears some flexion of the fingers, producing the characteristic " main en griffe " or " claw hand," though this is not so marked as in progressive muscular atrophy (q.v.).

There will also be anæsthesia over the cutaneous distribution of the nerve. Injury to the nerve at the wrist, below the origin of the dorsal cutaneous branch (this comes off about three inches above the pisiform bone of the carpus, and supplies the inner side of little finger and also contiguous sides of back of ring and little fingers), is followed by loss of sensation over inner border of palm and little finger, as well as the adjacent half of the ring finger ; on the back there is loss of feeling over the terminal phalanges of the little and half of the terminal ones of the ring fingers, together with paralysis of the hand muscles. The prognosis depends on the nature and situation of the injury ; a crush of the nerve may be incurable, section of the nerve may be capable of being sutured, inclusion in callus or scar tissue may be relieved. The electrical reactions will assist in forming an opinion. (*See* **Atrophy. Elbow.**)

After early suture and aseptic healing, sensation may be complete in about two years ; after secondary suture the hand can hardly be expected to regain its former usefulness. Motor recovery may occur in two years after primary suture, but after secondary suture it will scarcely ever be complete. (Sherren.)

For ulnar neuritis and migrating neuritis, *see* **Neuritis.**

UNREDUCED DISLOCATIONS.—It happens sometimes that, owing to associated injuries to the parts, or to the very serious condition of the patient, the surgeon is unable to undertake the operation of reducing a dislocation. In some of these cases of ancient dislocations there will be disability amounting to anchylosis of the joint, but in others there will often result a great deal of accommodation of the bones to their new positions.

This accommodation is seen in the shoulder and hip joints, where the head of the bone makes a depression for itself, and there is an attempt on the part of nature to make a new joint. Though in the shoulder there is much weakness, a great variety of movements may take place which render the arm quite useful, yet not, of course, up to a normal standard. In the hip there will be distinct lameness, and crutches will usually be required, though power of locomotion may sometimes be excellent. Unreduced complete dislocation in the ankle, knee, elbow, wrist will seriously diminish the working capacity of the limb. Operative resection at a joint may often be more effectual and less dangerous than an attempt at forced reduction of an old dislocation. Occasionally reduction of a dislocation by a severe open operation on the joint may be necessary. (*See* **Joint. Resections.**)

UPPER LIMB.—For fractures and dislocations see the various bones and joints—humerus, radius, shoulder, elbow, &c. **Contusions and wounds** may affect the various muscles, as biceps (q.v.) or nerves, as musculo spiral (q.v.). **Extensive losses of skin** may take a long time in repairing, and may result in cicatricial contracture and limitation in movements in joints, &c.

Wrenches or pulls may cause injuries to nerves and paralysis, which frequently get well if there is no severance, or if the severed ends can be united early good results may follow.

Subcutaneous ruptures of muscles may occur. These ruptures of the biceps or triceps are the most serious with regard to recovery of full use in the arm, as the wasting and weakness may be permanent if the rupture is not successfully united by suture. (*See* **Biceps.**)

Crushes of the forearm causing destruction of muscles, or wounds severing these or their tendons, may cause loss of the movements of the hand, and if these are such as not to be capable of repair by operation, deformities may follow later on as a result of the unopposed contractive action of sound muscles.

Deep wounds also involve the nerves, and if these are not soon united by suture, or if the wound becomes septic, and as a consequence fails to unite, then there is paralysis, which will be most probably permanent, with contracture and later deformities.

Fractures of both bones of the forearm frequently result in angular union and curvatures, and sometimes the broken ends fall together and unite ; the radius and ulna being then in contact, the important movements of supination (rotation of the forearm so that the palm of the hand looks upwards) and pronation (rotation of the forearm so that the palm looks downwards) are interfered with or lost.

A radiograph, carefully taken and interpreted, will show clearly the amount of displacement of the ends.

URETHRA.—The tube which in either sex conveys the urine from the bladder. Injuries to the urethra are more liable to occur in the male. They may be caused by falls astride a beam, blows taking effect on the perineum (q.v.), or as a complication of fractures of the pelvis.

Urethritis, or inflammation of the urethra, may be caused by injury, but is most frequently the result of gonorrhœa (q.v.). An examination of the urethral discharge will solve the problem by showing the presence of the specific microbe, as such venereal infection cannot be caused by injury. Urethritis caused by injury will last only a few days, and will not cause much incapacity for work unless the trauma has produced actual damage to the walls.

Rupture of the urethra is a very serious injury, the immediate result of which may be hæmorrhage and the extravasation of urine, requiring urgent operation. If the patient escapes the immediate dangers he may suffer from a permanent fistula, which may be incurable, or an intractable stricture requiring the regular use of dilating instruments.

Stricture of the urethra is a narrowing of the urethral tube. It is most frequently a consequence of antecedent gonorrhœa, but is occasionally the result of injury. The important consequences which ensue from this condition are that the bladder is with difficulty emptied, and there may be complete retention of urine. In old-standing or neglected cases, chronic cystitis (inflammation of the bladder) and disease in the kidneys may terminate life.

After rupture of the urethra and a resulting stricture, the patient will require to visit his medical attendant frequently in order to have instrumental dilatation. If rigors or chills follow this procedure, the patient may be obliged to rest afterwards in bed for a day or two; if the stricture at any time becomes impermeable an operation will be required, which often takes months in healing; even after operation, regular instrumentation cannot altogether be avoided.

URINE.—The secretion of the kidneys. Healthy urine has an amber colour, an acid reaction, a saline taste, and a specific gravity of from 1015 to 1025. The quantity passed in twenty-four hours varies according to the amount of fluid ingested and the amount excreted by the skin; the average is about fifty ounces. Some of the abnormal constituents are albumin, sugar, acetone and diacetic acid, pus, biliary pigments, hæmoglobin, blood corpuscles. (*See* **Albumin. Bright's Disease. Blood. Chyluria. Diabetes. Hæmaturia. Kidney.**)

Incontinence of urine is the involuntary voiding of the urine. It may occur in children without obvious cause and continue for many years, or be due to injury or disease in the bladder or spinal cord.

Retention of urine is inability to void the urine. It may be due to obstructions to the outlet situated in the bladder or urethra. It may be due also to injury in the brain or spinal cord, or it may follow operations or injuries affecting the rectum or genito-urinary organs. In some of these conditions it may be merely temporary.

Enlargement of the prostate gland (the gland situated at the neck of the bladder in the male, and normally about equal in size to a Spanish chestnut) may cause complete retention of urine, or a bladder full to overflow producing constant dribbling away of urine. These conditions have been the alleged result of injury, whilst as a matter of demonstration they were due to enlarged or hypertrophied prostate. According to Watson and Cunningham, about one man in every five after fifty years of age has some more or less enlargement of the prostate, and one in twelve has some symptoms of it. The gland may be injured by traumatisms of the perineum, and the result may be fatal from extravasation of urine, hæmorrhage or septicæmia.

VARICOCELE.—A dilated or varicose condition of the veins in the spermatic cord and pampiniform plexus. It is mostly found in the left side, and is said to occur in about 10 per cent. of adult males. The dilated veins can be readily felt in the scrotum, giving the sensation of a bag of worms. It is usually of slow development, and is believed to be predisposed to by the fact that the smaller veins have no valves, and that the veins on the left side open at a right angle into the left renal vein.

The condition may occur acutely from a sudden, heavy lift or strain ; under such circumstances there would be acute pain and swelling of the part. The treatment is rest in bed for a week or two until the acute stage has passed ; then, if there is then any inconvenience or pain, the veins can be removed by a simple operation, from which the patient will have recovered and be fit to return to work in less than six weeks. (*See* **Phlebitis.**)

Old varicoceles may be injured and thrombosed by blows, contusions or strains. A danger of thrombosis is the possibility of a clot being carried into the circulation, and lodged in the heart or lungs with fatal consequences, or in the brain, being followed by paralysis or perhaps death. When the acute stage of the thrombosis has subsided, leaving no embolism or other serious consequence, operative treatment will effect a radical cure. (*See* **Spermatic Cord.**)

VARICOSE VEINS.—These are dilated, tortuous and thickened veins. They occur with great frequency in the lower limbs. It is probable that there is some congenital tendency, or weakness in the walls of the veins which predisposes to the development of the condition.

The disease is usually slow in its progress, and may be caused, in predisposed persons, by long standing, and possibly by the constriction due to the wearing of tight garters, &c. The congestion and ill-nourished condition of the skin, in the areas drained by the diseased veins, renders it very liable to break down into a varicose ulcer (q.v.) as a result of slight traumatism, or even without the stimulus of injury. In cases of long standing the limb is swollen, and usually there may be seen several scars of previous ulcers.

Thrombosis and embolism (q.v.) may follow injury, which may be either direct or associated with fracture of the limb, a wrench or twist. An embolism in the brain or lung may cause fatal consequences. Injury may rupture a varicose vein and cause profuse or even fatal hæmorrhage.

The complications of varicose veins, which may or may not have a traumatic cause, are phlebitis, embolism, pyæmia, eczema, varicose ulcers. Fractures of the limb and consequent thrombosis of the deep veins from injury may result in the superficial veins becoming dilated and varicose in a compensatory effort to carry on the circulation; if the veins are not too extensively or severely affected, and if no complications are present, the use of bandages or supports will usually enable full work to be done; if there is great pain or phlebitis, ulcer, &c., there may be total incapacity for a considerable period.

The diseased veins may be removed by operation and full working capacity restored, but sometimes after operation recurrences are noted. In the great majority of cases it is prudent to wear a supporting bandage or stocking after the operation.

Cases of deliberate aggravation of varicose veins are known, the procedure adopted being the application of a tight bandage round the limb and its careful toasting in front of a fire. A month in hospital will definitely solve the problem. (*See* **Phlebitis.**)

VERTIGO. Dizziness.—This is a loss of the full function of equilibration. Vertigo may have a relation to the subject himself, the patient feeling as if he were turning round or sinking; or it may relate to the object, in which case the various objects appear to the patient to move. The attack may be of varying degrees of severity, from that of momentary reeling to actual falling. It may come on suddenly or gradually; if it develops gradually it is mostly slight in its effects, but may persist for a long time; it may be more or less continuously present, or there may be exacerbations. If it is caused by trauma severely damaging the labyrinth of the ear there will be deafness and a distressing attack of giddiness.

Loss of consciousness is rare, but nausea, and even vomiting, may follow; distinct attacks may be accompanied by cold sweats, feeble, irregular and unequal pulse.

The symptom may have its origin in actual disease of the external middle or internal ear. Sir William Gowers thinks that 90 per cent. of the cases of vertigo are due to disease in the ear. A careful examination of the organs of hearing is required in all these cases.

Intracranial disease (cerebellar abscess, meningitis, epilepsy, &c.), which may be of idiopathic or traumatic origin, may have giddiness as a distinct symptom, but such conditions will have other signs to assist in making a diagnosis.

Diseases of the heart and kidney frequently cause recurring attacks, as will also the circulation of certain poisons in the blood, such as alcohol, quinine, tobacco, &c., each having its more or less characteristic concomitant, objective phenomena to aid in the differentiation. In the so-called functional diseases, hysteria, neurasthenia, the vertigo is largely of the subjective type, and is rarely objective. A complaint of subjective vertigo, without any relation to pathological signs or symptoms, will call for minute investigation on the part of the medical examiner to enable him to draw a scientific inference as to whether the condition is one of simulation or a result of functional or organic disease. Gastric disturbances, either acute or chronic, are very common causes of vertigo of the mild but recurrent form. The most severe attacks of vertigo are seen in certain cases of ear disease, and to this the general term " Meniere's symptoms " has been applied. The onset is sudden, and may occur in a previously healthy subject; it may follow traumatism, hæmorrhage, acute inflammatory exudation, embolism; complete deafness on the affected side may ensue. There may be irregular movements of the eyes, and paralysis of the facial and other cranial nerves. Rarely is the issue fatal. In an article on aural vertigo (*B. M. J.*, April 10th, 1909), Syme cites Horsley and Ballance as having shown in the case of extra cerebellar tumours, and Stewart and Holmes from experiments, that irritation of the cerebellar connections or course of the vestibular nerve (nerve of equilibration, mesial root of auditory nerve supplying the vestibule and semicircular canals; the course of the nerve from the medulla inwards is to the crus and vermiform process of the cerebellum—Kerr Love) causes vertigo as in labyrinthine irritation, which has a tendency to fall to the affected side, whereas in destructive lesions of the labyrinth the vertigo is in the other direction. (*See* **Ear.**)

VOLVULUS.—A twisting of the bowel. The intestine is twisted on itself for more than three-fifths of a circle, as less than this does not cause obstruction (Kelly and Noble). This dangerous condition is predisposed to by congenital abnormalities, such as abnormally long mesentery and malposition of the gut. It may be excited by injury.

The mechanism of the twist appears to be that a loop of gut with an unusually long mesentery becomes distended, either by gas or fæces, and being suddenly rotated by a contusion, strain or effort is unable to unwind itself. It may also arise without any history of injury. The twisting at first actually takes place in the mesentery, and the lumen of the gut may not be fully occluded, but the blood-vessels in the mesentery are strangulated by the rotation. The onset is marked by a sharp pain, but the further course may for a short while show little of an alarming nature (Douglas); the pain may then increase, and be continuous when the strangulation becomes absolute; later there will probably be distension, vomiting, collapse, and finally death, usually within six days (Treves), unless relieved by surgical treatment. Waterhouse (*B. M. J.*, 29th May, 1909) states that he is convinced that spontaneous reduction is not infrequent, and that in several cases he believed the twist was reduced by an enema. The condition is rarely diagnosed before operation (Eisendrath), and once having occurred, it shows a tendency to recur. About 50 to 70 per cent. die after operation (J. D. Bryant). (*See* **Bowel. Peritonitis.**)

WOUNDS.—A wound is a solution of continuity of the soft parts of the body, made deliberately or suddenly. Wounds may be incised, contused, lacerated, punctured, poisoned. (*See* **Healing. Septicæmia.**)

WRIST-JOINT.—The joint formed between the carpus and the lower end of the radius and ulna. (*See* **Carpus.**)

For fractures and dislocations of the large bones, *see* **Radius. Ulna.** For tuberculous disease, *see* **Joint.** For inflammation of the wrist in miners, *see* **Tendon.** *See also* **Colles' Fracture. Dropped Wrist. Synovitis. Upper Limb.**

WRITERS' CRAMP. (*See* **Cramp. Telegraphists' Cramp.**)

WRY NECK. (*See* **Torticolis.**)

X-RAYS. (*See* **Radiography.**)

YELLOW ATROPHY (Malignant Jaundice).—A rare disease, which is almost invariably fatal. It affects the liver, which becomes reduced in size. Hunter believes it to be a toxæmic catarrh affecting the minute bile ducts, somewhat similar to the condition found after phosphorus poisoning (q.v).

Osler states that it has followed fright or profound mental emotion, drinking bouts, syphilis.

ZINC (*see* **Brassfounders' Ague**).—Poisoning by zinc may cause rarely peripheral neuritis (q.v.). Oliver quotes Schlockow as stating that the zinc miners and smelters of Silesia who have followed this occupation for ten or twelve years suffer from loss of the sense of touch, burning sensations in the feet, unsteadiness of gait, lesions which he attributes to disease in the anterior columns of the spinal cord. Other authorities consider these symptoms as due to lead poisoning, as some of the ores contain a certain amount of lead.

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APPENDIX.

SECTION ON INJURIES AND DISEASES OF THE EYE.

BY

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AMAUROSIS is a name given to complete blindness. In its strict sense it is confined to cases in which no lesion can be discovered in the eye to account for the loss of vision. The principal recognised forms are due to (*a*) poisoning with quinine, (*b*) uræmia, (*c*) hysteria, (*d*) simulation.

AMBLYOPIA is a term indicating poor vision without apparent cause, particularly when the condition is not explained by an ophthalmoscopic examination, The chief recognised causes of the condition are (*a*) toxic from poisoning, usually with alcohol or tobacco, or both combined, but less commonly with bisulphide of carbon, dinitro-benzol or iodoform; (*b*) congenital defect; (*c*) disuse (ex-anopsia), as in the deviating eye of squinters; (*d*) exposure to direct sunlight; (*e*) internal hæmorrhages; (*f*) diabetes; (*g*) uræmia; (*h*) hysteria; (*i*) reflex, chiefly connection with irritation of the fifth cranial nerve from carious teeth, &c.; (*k*) idiopathic night blindness; and (*l*) traumatic neurosis.

In the form last-mentioned, one of the most important symptoms is concentric contraction of the field of vision, but this may be absent, or if present may not be typical. This defect usually affects both eyes, but if there is hemi-anæsthesia it is most marked on the side of the most contracted field. The relative position of the boundaries of the colour fields is seldom altered.

This contraction of the field may be the only derangement of sensation, either special or general (Swanzy and Werner).

Simulated Amaurosis (blindness) or **Amblyopia** (defective vision).—We are lead to suspect the existence of simulation when the functional disturbances do not correspond with the objective signs, or when the results of examinations at different times and under different circumstances (*e.g.* with test objects at varying distances), do not correspond. In all cases of simulation objective tests are the most reliable, but the information given by them is only qualitative and not quantitative, as with some subjective tests.

Simulated blindness of one eye: The commonest cases are those in which amaurosis or amblyopia of one eye only is pretended, the other eye being admitted to be good. In this case the objective tests depend on (1) the condition of the pupil, (2) the direction of the visual axes.

(1) In dealing with the condition of the pupils it is necessary to be on the look out for alterations in them, produced by the instillation of drops, especially mydriatics. The points to be noted are the size and the reactions. With regard to the size, the pupil of a defective eye always tends to be larger than that of its fellow, but it must not be forgotten that an eye with quite good vision may have a larger pupil, either as a result of disease or without any discoverable cause. The reactions of the pupils are direct and consensual. If light is thrown into a healthy eye its pupil contracts (direct reaction), and at the same time the pupil of the other eye also contracts, even if it is shaded from the light (consensual reaction). If an eye is amaurotic its own direct reaction and the consensual reaction of its fellow should be absent (although they may be present in exceptional cases), while if the eye is amblyopic they should both be sluggish.

The fact that one pupil remains motionless when exposed to a bright light, while it contracts when a light is thrown into the other eye or under the influence of accommodation and convergence, points with great probability to the existence of unilateral amaurosis.

(2) A person with perfect sight will see double unless the visual axis of each eye points to the same spot, but when one eye is very defective there is a tendency for it to deviate. The absence of evident deviation is, therefore, evidence against the existence of amaurosis or extreme amblyopia, but if deviation is present it must be remembered that both the faulty direction and the amblyopia may be the result of an old-standing squint.

If a prism is placed in front of one eye of a person with binocular vision it will cause diplopia by altering the course of the rays of light which pass through it; but if the double vision is not too great the eyes will overcome it by deviating in the appropriate direction, and on removing the prism will make a corresponding movement in the opposite direction. If, therefore, a prism of such a degree that diplopia produced by it can be overcome by the eyes (*e.g.* one of ten degrees with the base towards the temple) be held in front of the defective eye, and the patient can be made to read, and if, on removing the prism the eye be seen to move sidewards, it may be regarded that such an eye sees (von Welz).

The subjective methods are very numerous, and require to be constantly varied. The principles underlying the chief of them will be described:—

(1) If a rod (*e.g.* a lead pencil) be held between the face and a sheet of print, a person with binocular vision can see every letter on any line without moving his head or the rod; while if only one eye is used, some letters are obscured by the rod.

(2) The method by prisms consists in using the glasses so as to sometimes produce monocular diplopia, and at other times binocular diplopia. If the patient really has one blind eye he will have no difficulty in telling when he sees an object single and when double; but if he sees with both eyes he can be confused. The patient may also be asked to do something wearing a prism, which would be

easy if one eye is blind, but difficult or impossible owing to double vision if both eyes see.

(3) The methods with uncoloured glasses. A lens of such a strength that it would be impossible to see through it is put in front of the good eye when any letters that are read must be seen by the supposed amblyopic eye.

(4) The method with coloured glasses and letters. The patient is asked to read letters alternately red and green while wearing spectacles with a red glass in one eye and a green glass in the other. Each eye can only see the letters of one of the colours.

(5) The method with the stereoscope. By using a stereoscope with suitable differences between the two pictures it is frequently possible to get a simulator to say that he sees marks which are not present in the picture seen by the good eye.

(6) The method with pseudoscopic apparatus, or arrangement of mirrors so contrived as to make the patient think he is seeing with the good eye, while he is in fact using the one which is alleged to be amblyopic.

II. Simulated amblyopia in both eyes, or one eye, the other being blind or absent.

In these cases the patient must be examined repeatedly under different conditions, with test types of different kinds and at varying distances, and the field of vision should be carefully taken. It is only by establishing inconsistencies between the answers given under varying circumstances that an opinion can be formed as to the *bona fides* of these patients.

III. Simulated blindness of both eyes. It is very rare for anyone to pretend that both his eyes are blind, and such an impostor would be very likely to betray himself by the absence of the characteristic attitude and gait. On examination the reaction of the pupils and the indications furnished by the directions of the visual axes would be sufficient to demonstrate the fraud.

IV. Hystero-traumatic amaurosis or amblyopia. This is characterised by abolition or lowering of central vision, diminution of light sense, concentric contraction of the field of vision for white and colours, inverted order of the colour fields, together with other ocular and general symptoms of hysteria, especially the characteristic evolution, variability, mobility and contradiction of symptoms, and the abruptness of onset and recovery.

APHAKIA is the condition produced by the removal of the crystalline lens from the eye, as in the operation for cataract (q.v.).

BURNS OF THE EYE may be caused by exposure to flames, but are more commonly due to injury with hot or molten metal, or with chemicals, such as sulphuric acid or lime. They may destroy the eyelids, causing inflammation of the conjunctiva or cornea, or destruction of the eye, or they may injure the conjunctiva directly, giving rise to symblepharon, or cause ulceration of the cornea with ultimate formation of leucomata or even loss of the eye. They must always be regarded as serious. Cases in which the injury at first seems slight frequently result in serious damage to the eye, or even its total loss.

CATARACT is an opacity in the crystalline lens, preventing light from reaching the retina. It may be complete or incomplete, and the latter may be stationary or progressive. It may be (1) congenital ; (2) due to old age (senile) ; (3) due to disease of the body, such as diabetes ; (4) due to disease of the eye, such as irido-cyclitis, choroiditis, detachment of the retina, &c. (secondary) ; (5) traumatic.

Traumatic cataracts are usually caused by perforating wounds of the eyeball, which also perforate the capsule of the lens, and are often associated with prolapse of the iris.

In young individuals, up to about the age of 25 years, an injured lens may become absorbed, but while doing so it may swell up so much as to cause hardness of the eye (glaucoma), in which case the sight will be lost unless the tension is quickly relieved by operation. In older patients this secondary glaucoma is almost certain to develop if the lens is not removed, and it is also necessary to operate on them, owing to the development of a hard nucleus in the lens, which will not undergo absorption. The greatest risk associated with this form of traumatic cataract is that of infection, leading to loss of the eye from panophthalmitis or from irido-cyclitis, with risk to the other eye from sympathetic ophthalmia.

In rare cases cataracts may develop in eyes after severe blows without any perforation of the eyeball (concussion cataract). Such cataracts may become complete within forty-eight hours of the injury ; they are often due to bursting of the lens capsule, but may occur without any opening of that membrane (Fuchs).

Cases of cataract following shocks from electricity have been recorded by Desbrieres and Bargy (*Annales d'Oculistique*, Feb., 1905), Terrien (*Arch. d'Ophtalmologie*, November, 1908), Roche (*Annales d'Oculistique*, May, 1909), and others. These cataracts come on some weeks after the accident, and may remain incomplete or become rapidly mature. After operation half-normal vision was recovered in two cases. The tension of the electricity causing the cataracts varied from 500 to 20,000 volts.

Bottlemakers' Cataract. — Industrial employees, especially finishers in factories where ordinary heavy metal bottles, *e.g.* wine, whisky and beer bottles, are made, are very liable to suffer from a form of cataract which comes on earlier in life than ordinary senile cataract (before the age of 50 in two-thirds of the cases), and commences as a saucer-shaped opacity like a cobweb in appearance, situated immediately within the posterior capsule of the lens.

The cataract is primary, and unaccompanied by any other disease in the eye, which regains good vision after its removal. Opinions are divided as to whether the cataract is caused by excessive heat or light. It has been suggested that the occurrence might be prevented by the wearing of coloured glasses (this is rather difficult owing to the excessive perspiration), or by the interposition of some form of screen between the workmen and the molten glass.

The disease has been scheduled as industrial, and those suffering from it are allowed compensation for six months, provided they undergo operation.

An eye from which a cataract has been removed is known as an **aphakic eye,** and unless it was previously very short-sighted, requires a strong convex glass to give it clear vision for distance, and a still stronger one to enable it to see objects near at hand (*e.g.* to read a book).

A good uninjured eye will not, as a rule, work well with an aphakic one, and consequently the owner prefers to depend on the good one alone and dispense with glasses.

In these cases the aphakic eye is of value, as it gives warning of large objects situated so much towards its own side that they cannot be seen by the sound eye, but it is useless for binocular vision.

CHOROID.—This is the posterior part of the middle tunic of the eye. It is situated between the sclerotic and the retina, and consists of blood vessels, which supply nourishment to the outer layers of the retina. It is liable to be cut or torn in penetrating injuries, and it may also be ruptured from a blow on the eye, or by concussion from an explosion.

The seriousness of a choroidal rupture depends on its position. If it is situated in the periphery of the eye it will probably cause little or no impairment of sight, but if it involves the macula lutea (*i.e.* the spot on which all objects which we wish to see clearly are focussed) it will permanently and seriously interfere with the vision of the eye.

In some cases blows on the eye cause damage entirely localised in the macula lutea and its immediate neighbourhood, causing a punched out appearance (hole in the macula), with permanent loss of central vision, and in others rupture of the choroid is followed by a progressive form of choroiditis which is associated with very considerable disturbance of sight. Rupture of the choroid is accompanied by hæmorrhage, but except when associated with some such lesion choroidal hæmorrhage is not a common result of injury.

CILIARY BODY.—This is the part of the middle or vascular tunic of the eyeball, between the choroid behind and the iris in front. It is situated immediately behind the junction between the cornea and sclerotic, and consists of (1) the ciliary processes—a number of folds consisting of very vascular connective tissue, covered by pigmented epithelium ; (2) the ciliary muscle, which lies between the ciliary processes and the sclerotic has two sets of fibres, external or circular, and internal or longitudinal, and by its contraction causes accommodation or focussing of the eye for near objects. The ciliary processes secrete the aqueous humour, and cyclitis or inflammation of the ciliary body seriously interferes with the nutrition of the eye.

Cyclitis or inflammation of the ciliary body (v. **Irido-cyclitis**).

CONJUNCTIVA.—This membrane lines the posterior surface of the eyelids (palpebral conjunctiva) and the anterior surface of the eyeballs (bulbar conjunctiva) as far as the limbus or margin of the cornea. Where it passes from the lids on to the eyeball it is thrown into folds, which are known respectively as the upper and the lower fornix. Injuries may cause extravasation of blood under the conjunctiva (subconjunctival hæmorrhage), which gives rise to a very alarming appearance, but if uncomplicated is of no consequence, and disappears naturally in about ten days.

Wounds.—These may be very extensive, but unless infected usually heal rapidly without causing any permanent damage. They may, however, be complicated by wounds of the eyelids or eyeballs, in which case they are of secondary importance.

Conjunctivitis, or inflammation of the conjunctiva, is usually due to infection with some micro-organism. It may, however, be caused by injury, either sudden, as from a blast of dust, or continuous, as from constant exposure to irritating substances. In dealing with alleged cases of traumatic conjunctivitis, it is essential to ascertain that the inflammation is really due to injury, and if so whether the injury was received during the course of the patient's employment, as cases are not unknown in which the disease has been produced by the insertion of some foreign body or irritating material. As a rule, traumatic conjunctivitis yields rapidly to treatment when the cause is removed, but it may leave an irritable state of the membrane, causing the patient to be unable to resume his former occupation.

CONTUSIONS of the eyes or injuries with objects which do not themselves penetrate the eyeballs may cause the following lesions: Ecchymosis of the eyelids, retro-ocular hæmorrhage, fracture of the orbital walls, hyphaemia, irido-dialysis, iridemeria or traumatic aniridia, rupture of the sphincter iridis, traumatic mydriasis, traumatic myopia, concussion cataract, rupture of the zonule of Zinn with luxation or subluxation of the lens and probably secondary iridocyclitis, hæmorrhage in the vitreous, rupture of the choroid detachment of the retina and rupture of the cornea or sclerotic. Even comparatively slight contusions, with almost complete integrity of the exterior of the eye, may be followed by very serious damage to the deeper parts of the eye, such as optic neuritis or chorioretinitis Combaudin (*Thèse de Bordeaux,* 1908) or vitreous hæmorrhage Antonelli (*La clinique Ophtalmologique,* Juin, 1909), which often give rise to serious and permanent defects of sight.

CORNEA.—This is the transparent part of the wall of the eyeball, situated in front of the iris (the colour of the eye) and the pupil, and separated from them by the anterior chamber containing a watery fluid known as the aqueous humour.

Corneal Abscess.—A contusion of the eye by a blunt instrument without causing either a cut or an abrasion of the cornea will very frequently produce an abscess in its layers (Beaumont), but a more common cause of the condition is infection from a septic wound. Labourers in the cornfield are particularly liable to it, the cornea being scratched by a beard of grain infected with a form of aspergillus. The abscess may spread to the surface, forming an ulcer (q.v.), or may become absorbed without causing ulceration, but leaving considerable opacity behind (Swanzy and Werner).

Foreign bodies in the cornea.—Injuries to the eye by fragments of iron, stone, coal, &c., are among the commonest accidents to which the body is liable. The foreign bodies may simply cause an abrasion, or a more or less deep wound, or they may become fixed in the membrane, and in rare instances, especially in the case of grains of gunpowder, may remain embedded in it; more frequently, however, they are extruded by ulceration, or are removed by a surgeon or by some comrade of the injured person.

The injury done by such fragments depends on (1) the depth to which they penetrate, as a perfect cure may result if they are superficial, but a permanent opacity (leucoma) will remain if they are deeper; (2) the position of the injury, as opacities situated peripherally interfere with the sight much less than those which are central; (3) the density of the resulting opacity, as a small dense opacity, even when situated centrally, may cause less disturbance of vision than a much fainter one, because rays of light pass through the latter in irregular directions and cause blurring of the retinal images; (4) the occurrence or non-occurrence of infection of the wound, from micro-organisms carried to it (*a*) by the body causing the injury, (*b*) from the conjunctiva or lacrymal sac, (*c*) by an instrument used to remove the foreign body. This may cause an infected ulcer of the cornea, giving rise to damage to the eye varying from a more or less dense leucoma to total loss of sight or even of the eyeball.

Wings of beetles and scales of seeds may get into the eye and adhere to the cornea by their concave surfaces for considerable periods of time, causing surprisingly little irritation owing to the smoothness of their convex surface against which the eyelid rubs.

Inflammation of the cornea (Keratitis).—All injuries to the cornea cause more or less inflammation in it, but there are three forms of traumatic keratitis which require special mention :—(1) Deep traumatic keratitis : this is a deep-seated opacity in the posterior layers of the cornea, following injuries, especially contusions. It usually runs a fairly rapid course, but the inflammation may persist for a long time, and a permanent opacity may be left. (2) Traumatic neuro-paralytic keratitis : this is a form of inflammation without any direct blow on the eye, following injury to the fifth cranial nerve caused by a fracture of the orbit, or of the base of the skull, or by a penetrating wound. The injury to the nerve interferes with winking and lacrymation, and renders the cornea anæsthetic, so that particles of dust, possibly carrying micro-organisms, can lodge on it without being removed in the normal way. In addition, the nutrition of the cornea is impaired, so that the inflammation is frequently very severe and the prognosis is bad. (3) Bullous keratitis : this condition follows blows and abrasions with blunt instruments, and consists in the repeated formation, at the site of injury, of a vesicle, which by stretching the corneal nerves causes severe pain. The outlook is unsatisfactory, owing to the frequence of recurrences which ensue, even after weeks of apparently complete cure.

Rupture of the cornea may occur following very severe contusions, but is much rarer than rupture of the sclerotic. It is usually associated with such severe damage to the rest of the eye that sight is hopelessly lost, and enucleation is necessary.

Perforating wounds of the cornea.—Objects of various sizes, even very small ones, when driven by great force may perforate the cornea, causing a wound which, if uncomplicated, may heal, leaving a linear scar, and also usually more or less irregularity of the surface causing astigmatism. Such wounds, however, are usually complicated by prolapse of the iris (q.v.), and the lens may also be injured, causing traumatic cataract (q.v.), or they may become infected.

DEFECTIVE VISION AND EARNING CAPACITY.—The question of the influence of defective vision in one or both eyes on the earning capacity is a very complicated one, and our knowledge with regard to it is still far from complete. In the following remarks attention will be called to the principal classes of cases which may occur, and the factors which have to be considered with regard to each of them.

(1) Influence of diminished vision in both eyes on earning capacity. To enable a workman to earn full wages it is not necessary that he should have full physiological vision. It is considered that a skilled labourer with 0.75 normal vision, or an unskilled labourer with 0.50 normal vision, need not suffer any loss in earning capacity owing to defective sight. On the other extreme a skilled labourer is unable to earn anything at all at his trade unless he has at least 0.15 normal sight, while an unskilled labourer with less than 0.05 normal sight cannot do any work. Between these limits the earning capacity diminishes irregularly, a considerable decrease in visual acuity being at times unaccompanied by any diminution in the earning capacity which may be seriously impaired by a slight further loss of sight.

(2) Loss of one eye, the other being perfect. This entails the following disabilities: (*a*) Absolute disqualification for certain occupations, and loss of chance of promotion in others; (*b*) loss of one-sixth of the visual field; (*c*) loss of binocular vision entailing loss of stereoscopic vision,

including the power of estimating of distance and judging size. In old individuals the power of judging distances and recognising the depth of solid bodies may remain permanently absent, but in those who are younger it is usually recovered to a large degree after an interval varying from a few months to a year or two. (*d*) The influence of the deformity on the chance of getting work.

(3) Loss of vision in one eye, the other being perfect. This causes the same disabilities as loss of an eye, except that there may be no disfigurement. Sooner or later, however, most blind eyes develop a squint.

(4) Defective vision due to aphakia, the other eye being perfect. An aphakic eye, *i.e.* one from which a cataract has been removed, does not see distinctly unless there is a strong lens in front of it, and will not work with a sound eye. Apart from having a good eye in reserve the only advantage which an individual with one perfect and one aphakic eye has over an individual with one perfect and one blind is that the former has a full visual field. An aphakic eye may be valuable to carters and those who follow similar occupations in which a wide field of vision for larger objects is advisable.

(5) Defective vision, not due to aphakia, in one eye, with perfect vision in the other. This does not interfere with the earning power until stereoscopic vision is lost, which does not occur until the vision in the defective eye is reduced to less than one-sixth normal. In trades which require stereoscopic vision for accurate judgment of distances, &c., any reduction of the vision of one eye below one-sixth normal may cause very serious loss of earning power.

(6) Defective vision in both eyes. The possible combinations of this condition are so numerous that it would be impossible even to attempt to enumerate them. As a rule the condition of the better eye is the predominating factor, but attention should also be paid to the refraction and the possibility of improving the sight by means of glasses and the presence or absence of stereo-

scopic vision. (Wagenmann in *Græfe Sæmisch Handbuch.*)

DIPLOPIA, or double vision, may be monocular or binocular. When monocular it may be a symptom of incipient insanity, or it may be due to partial dislocation of the lens, or to the presence of a defect in the iris, *e.g.* irido-dialysis, causing an opening which acts as a second pupil. When binocular it depends on some defect in the muscles which move the eyeball, or in the nervous control causing one or other of the eyes to deviate or point in a wrong direction. Of the two images of any object which are seen by a person suffering from diplopia, the one perceived by the healthy eye is known as the true image, and the one perceived by the deviating eye is known as the false image or the shadow.

The diplopia is called homonymous when the false image is in the same side as the deviating eye, crossed when it is in the opposite side, and vertical when one image is higher than the other.

Diplopia may be caused by orbital, basic, pontine or cerebral lesions. The chief orbital causes are displacement of the eyeball from pressure of a tumour or abscess, and injury to some of the extra-ocular muscles.

Basic diplopia is due to paralysis of one or more of the extra-ocular muscles from a lesion of their nerve supply. It is usually of rheumatic or syphilitic origin, but may be caused by the pressure of tumours, or by fracture of the base of the skull. Traumatic diplopia may be primary when it comes on immediately, and is ascribed to direct injury by the fractured bone ; or secondary when it comes on some days or weeks later, and is due to compression of the nerve by hæmorrhage, inflammatory exudation or the formation of callus.

The pontine or cerebral lesions which give rise to diplopia are caused by nervous or vascular disease. Traumatism sufficient to produce them would almost certainly prove fatal.

There are few more serious ocular accidents to a workman, short of the loss of an eye, than one which causes diplopia (Beaumont), as the troublesome double sight prevents anything like accuracy of manipulation work unless one eye is covered.

The prognosis of traumatic diplopia is, as a rule, bad except in cases due to pressure from inflammatory exudation or abscess in the orbit, but basic cases, due to pressure from hæmorrhage or exudation, may recover if absorption takes place. The wearing of prisms may help if the paralysis is partial, but if it is complete they are unsatisfactory, as they can only give a fixed correction, while the amount of the diplopia varies according to the direction in which the eyes are turned.

Operation may improve the condition, but, as a rule, does not cause a perfect cure.

ELECTRIC OPHTHALMIA.—Exposure of the eyes to strong light from electric arc lamps sometimes gives rise to a condition resembling the so-called snow blindness to which mountain climbers are subject. This consists of conjunctivitis with opacities and erosions of the cornea accompanied by contraction of the pupil. The disease causes very severe symptoms, but as a rule recovery is rapid when exposure to the light is discontinued.

Exposure to very bright electric light may be followed by blindness due to injury to the retina, and comparable to the blindness which is at times caused by observing eclipses of the sun without proper protection. This blindness may pass off in time or may remain permanent.

Electric Cataract. (*See* **Cataract.**)

EYELIDS consist of two broad folds of skin supplemented by muscles, dense fibrous tissue and fascia, and lined by the conjunctiva ; their free margins, where the skin and conjunctiva meet, are provided with a row of hairs, the eyelashes or ciliæ.

Ecchymosis, or black eye, is due to effusion of blood into the lax tissues of the eyelids, and is usually caused by a blow or a fall, but may also be induced spontaneously by excessive exertion or severe paroxysms of coughing.

Severe injuries to distant parts of the head, especially when associated with fracture of the base of the skull, may at times cause a form of ecchymosis which does not come on for some hours after the injury, and is characterised by the absence of œdema.

Emphysema of the eyelids, or entrance of air into the orbital tissue, occurs when a communication is established with the nasal cavity, or some of the air cells opening out of it. It is a sign of fracture of the orbital walls, and in itself it is of no importance.

Wounds of the eyelids.—Punctured wounds are usually of little consequence. Incised or lacerated wounds usually unite without deformity, unless the edge of the lid is involved, when a depression on its surface or a permanent cleft will be left, unless the edges of the wound are brought together very accurately.

Ectropion, or eversion of the lid, may be caused by injuries, especially burns, but is also frequently the result of chronic inflammation, especially in old people. It is important, not only owing to the disfigurement which it causes, but because it is always complicated by inflammation of the conjunctiva owing to exposure, and the cornea may also become involved, leading to more or less serious defect of sight.

Entropion, or inversion of the eyelids, may be caused by injury, but more frequently results from disease, especially trachoma. Owing to the rubbing of the eyelashes against the conjunctiva and cornea, it always sets up an irritable condition of the eye, and may cause serious inflammation or loss of sight.

Erysipelas of the eyelids may follow injuries. If superficial it subsides without leaving permanent damage, but if it involves the tissues of the orbit (q.v.) it may lead to most serious consequences.

Ankyloblepharon is an adhesion of the edges of the eyelids to each other, which is usually caused by injuries, especially burns involving the palpebral margins in the neighbourhood of the canthi, but may be produced by severe forms of conjunctivitis, especially diphtheritic, or may be congenital. The condition is usually associated with symblepharon (q.v.), and it may be difficult or impossible to cure it.

Ptosis, or drooping of the lid, when of traumatic origin, may be due to (1) tearing of the levator palpebræ muscle; (2) injury to the branch of the third nerve, which supplies the levator palpebræ; (3) injury to the sympathetic nerve, in which case it is slight, and associated with contraction of the pupil and diminished tension of the eyeball; (4) orbital periostitis; (5) blows with blunt instruments.

The last variety is probably due to hæmorrhage into the sheath of the muscle, and usually disappears completely in a couple of weeks. The prognosis in the other varieties varies, but the deformity can usually be much improved by operation.

The importance of the condition from a medico-legal point of view is due to the interference with vision from the drooping of the lid, especially when the patient has to climb ladders, or work when looking upwards (Beaumont).

Symblepharon is an adhesion, partial or complete, of the eyelid to the eyeball, and is usually the result of a burn of the conjunctiva by fire, molten metal, acid or lime. The condition becomes of importance if it interferes with the movements of the eyeball, or if it encroaches on the cornea so as to obscure the sight.

FOREIGN BODIES frequently find their way into the conjunctival sac, and may cause great irritation, which rapidly subsides on their removal. Occasionally such foreign bodies may become lodged in the superior cul-de-sac, and be overlooked even after inversion of the eyelid, when they give rise to a persistent conjunctivitis. Small foreign bodies may become fixed in the conjunctiva, or even the sclerotic. They require removal, but do not cause any permanent damage unless the wound is infected.

Foreign bodies frequently become fixed in the cornea (q.v.). Injuries to the eye by large bodies cause contusions or lacerations or burns.

Foreign bodies—*e.g.* chips of metal, fragments of stone and glass, or splinters of wood—may penetrate the eye and be retained in it, causing injuries which are of great importance. When such foreign bodies are large the eye is so seriously damaged that it cannot be saved, and when they are infected the eye is inevitably lost from septic inflammation ; but when they are small, the actual injury caused by them may not be great, and, provided they have been aseptic and can be removed, it may be possible to save the eye.

Although there are some undoubted instances in which tiny foreign bodies have been retained in the interior of an eye for many years without causing any trouble, it is undeniable that the presence in an eye of a foreign body, even if aseptic, is almost certain to set up inflammation in it, and is very liable to cause sympathetic disease in the other eye. Fragments of copper are particularly dangerous. Foreign bodies may enter the eye by perforating the cornea or the sclerotic. In the former case they may be found in the anterior chamber, the iris or the lens, but more frequently pass through the iris and lens into the vitreous, where they remain free or become fixed to the posterior wall of the eyeball.

Foreign bodies which perforate the lens give rise to traumatic cataract. This may remain localised, but usually becomes complete, and requires removal. The presence of traumatic cataract not only complicates the case, but very much diminishes the value of the eye, should it be saved, owing to the resulting aphakia.

Foreign bodies which enter through the sclerotic necessarily injure the choroid and retina, as a result of which cicatrical contraction may be set up, and cause detachment of the retina, with loss of sight. As there may be a considerable interval between the accident and the occurrence of this complication, during which the eye has been regarded as saved, the prognosis in such cases should be very guarded.

It must always be remembered that a foreign body which has penetrated the eyeball may also have pierced its posterior wall, and become lodged in the orbit.

The results of perforating injuries of the eye, with retention of the foreign body, may be summarised as follows :—

(*a*) The eye is hopelessly lost if the actual damage to its tissue is very severe, or if the foreign body is septic.

(*b*) The eye should be removed if the foreign body cannot be extracted.

(*c*) The eye need not be removed if it is free from inflammation and the foreign body has been extracted.

(*d*) Such eyes may have any degree of vision ranging from blindness to perfect sight. Very frequently they are aphakic, and cannot see clearly without cataract glasses.

(*e*) Eyes in which the immediate result is good may subsequently become blind from detachment of the retina.

GLAUCOMA is a complex morbid process depending essentially on an excess of pressure in the chambers of the eye (Priestly Smith in *Norris and Oliver*), and the name is properly applied to every eye thus affected, whether it be suffering from other manifest disease or not (*ibid.*). It may be primary or secondary. Secondary glaucoma may be of traumatic origin, and due to (1) perforating wounds or ulcers of the cornea which have caused the formation of anterior synechiæ (q.v.) ; (2) iritis, with formation of annular or total posterior synechiæ ; (3) serous cyclitis ; (4) dislocation of the lens forwards into the anterior chamber, backwards into the vitreous, or sidewards ;

(5) swelling of the lens after injury (traumatic cataract); (6) cysts of the iris.

Traumatic glaucoma is a serious condition, and, unless relieved, will invariably cause blindness of the eye.

Except in cases complicated by intra-ocular hæmorrhage, operation is indicated; but in spite of all that can be done, the eye may become blind, and it may become necessary to enucleate it for the relief of pain.

If the tension is successfully relieved, the utility of the eye will depend on the amount of damage which has been done to its tissues. Thus in all cases due to dislocation of the lens, or to traumatic cataract, the eye, if it can be saved, will be aphakic (q.v. cataract).

HEMIANOPSIA is loss of one half of the field of vision, usually in both eyes, as a result of a lesion (*a*) at the centre of vision, (*b*) at the chiasma, or place where the two optic nerves cross, or (*c*) somewhere between these two places.

It is usually absolute, involving form sense, light sense, and colour sense, but may be partial, involving only one or two of these visual perceptions. Cases in which a section of the field of vision is missing are known as incomplete or partial hemianopsia.

The vision may be lost in the corresponding, *i.e.* right or left half of each eye (homonymous hemianopsia); in the outside of each field (temporal hemianopsia); or in the upper or lower half of each field (superior and inferior hemianopsia or altitudinal hemianopsia). It is doubtful whether nasal hemianopsia or loss of the inner side of the field of each eye has ever been observed (Swanzy and Werner).

HYPHAEMA is a collection of blood in the anterior chamber or space between the cornea and iris, normally filled by aqueous humour. It may occur spontaneously as a result of old-standing disease, *e.g.* cyclitis, or as a complication of perforating wounds of the eyeball, including operations, or of concussion injuries, especially those which cause irido-dialysis. In eyes previously healthy it is usually absorbed rapidly, and does not cause any permanent damage.

HYPOPYON is a collection in the anterior chamber of a whitish exudation, resembling pus: it occurs in certain corneal ulcers and in cyclitis, especially when of traumatic origin. It is always a serious symptom, but clears up if the disease on which it depends is cured.

The **IRIS** constitutes the anterior part of the uveal or vascular tunic of the eye, and consists of a delicate, contractile, variously-tinted septum, containing a central opening, the pupil. It is commonly known as the colour of the eye.

Aniridia. Irideremia, or absence of the iris, may occur as a congenital abnormality, or a result of a blow in the eye; the whole iris may be torn from its insertion, and be found lying in the anterior chamber or under the conjunctiva, having in the latter case passed through a rent in the cornea scleral margin (Swanzy and Werner). This lesion is permanent, and is usually associated with serious damage to more important parts of the eye; but even if sight is retained, there may be so much dazzling as to render the eye practically useless.

Irido-dialysis, or separation of part of the circumference of the iris from its attachment, is caused by blows on the eye. It may be so small as to be barely perceptible, or may involve as much as half the circumference of the iris. The lesion, which is almost invariably permanent, may cause very little disturbance of the functions of the eye even when extensive, or may give rise to dazzling or to monocular diplopia.

Irido-donesis, or tremulous iris, is a condition which occurs when the iris is deprived of the support of the lens on which it normally rests. It is a symptom of dislocation of the lens.

Iris, Anteversion of, consists in a turning of part of the iris so that its posterior surface looks forwards. It is always accompanied by irido-dialysis.

Iris, Coloboma of, is the gap left when part of the membrane is absent. It may occur as a congenital abnormality, or as a result of a concussion, but is more usually the result of operation (iridectomy) undertaken for optical purposes (to make an artificial pupil), or for the relief of some condition of the eye due to disease, *e.g.* glaucoma, or to injury, *e.g.* perforating wound causing prolapse of the iris.

Iris, Cysts of.—These are exceedingly rare, and may have either serous or solid contents. In at least three-fourths of the cases they develop some months or years after a penetrating injury of the eyeball, while the fact that there is no evidence of previous injury in the remaining fourth obviously does not exclude the possibility of such having taken place (Brailey and Stephenson in *Norris and Oliver*). Swanzy, however, claims that he has observed a case of serous cyst, in which he was able to exclude traumatism as a cause (Swanzy and Werner).

All these cysts are sources of serious danger to the eye, as they may set up secondary conditions, such as irido-choroiditis or glaucoma, while they have been known to cause sympathetic ophthalmia ; but this last can only occur when some infectious process has been set up in the eye, either by the injury which originally gave rise to the cyst or by an attempt to remove the cyst.

The removal of iris cysts is always indicated. When they are small it can be satisfactorily accomplished, but when they are large it may be very difficult.

Iris, Retroflexion of, consists in a turning of the membrane backwards, so that it lies in front of the ciliary processes, causing an appearance resembling that of a coloboma. The condition, which is incurable, may give rise to dazzling, and is often associated with a slight dislocation of the lens (q.v.).

Iris, Rupture of Sphincter of.—Blows on the eye may cause a rupture of the sphincter iridis, the muscle which causes contraction of the pupil. The lesion is incurable, and causes permanent dilatation of the pupil (Traumatic Mydriasis, q.v.).

Iritis and Iridocyclitis.—Iritis, or inflammation of the iris, may be primary or secondary. When severe it is always complicated by cyclitis or inflammation of the ciliary body, constituting iridocyclitis. These two conditions are so intimately associated that they cannot be satisfactorily described separately. When primary iridocyclitis may be caused by general diseases, such as syphilis, rheumatism, gonorrhœa or tuberculosis, acute infectious diseases or disorders of metabolism, or by local causes such as injury or sympathy; when secondary it is a complication of inflammation of neighbouring tissues, *e.g.* the cornea or sclera, or of traumatic cataract.

Traumatic iridocyclitis may result from all sorts of injuries, but is most frequently caused by perforating wounds, especially when a foreign body has been left in the eye. The immediate cause of the inflammation may be either (*a*) mechanical injury from tearing or crushing, (*b*) chemical irritation from the presence of chemically-active foreign bodies, or (*c*) infection. Iritis due to concussion or aseptic wounds is comparatively slight, and readily yields to treatment, while that due to chemical causes subsides if the irritating body can be removed; but that due to infection, which is, unfortunately, by far the most frequent, may run a very protracted course, and even if it does not destroy the eye always gives rise to anxiety, owing to the risk of its causing sympathetic ophthalmia (q.v.). A man suffering from traumatic iritis is not likely to be fit for work for three months after its onset, and in some chronic cases may be disabled for a much longer period, while even after having recovered he may suffer from relapses (Beaumont). In estimating the probable duration of an attack of traumatic iritis, and the chances of relapses, it is important to take into consideration the presence or absence of a syphilitic or rheumatic diathesis.

The **LACRYMAL APPARATUS** consists of the lacrymal gland which secretes the tears, and is situated in the upper outer angle of the orbit, and of the passages by which the tears pass into the nose. These are the puncta lacrymalia, two small openings, one in the upper lid and one in the lower lid of each eye, close to their inner ends; the canalculi, two narrow tubes running from the puncta towards the nose, and opening into the lacrymal sac, a receptacle situated in a hollow in the lacrymal bone in the lower inner angle of the orbit, and the nasal duct, a passage through the bones from the inner angle of the orbit to the nasal cavity.

As the result of injury the lacrymal gland may be dislocated, or it may be punctured or laid bare by a wound.

As far as the gland itself is concerned, such injuries are of no consequence, as it can be removed without causing any inconvenience; but infection of open wounds may give rise to troublesome suppuration.

As a result of injuries, especially burns, or fractures involving the walls of the nasal duct, the lacrymal passages may become blocked. In some cases this does not give rise to any inconvenience, but in others it causes lacrymation (overflow of tears from the eyes). Obstruction of the lacrymal passages may be frequently relieved by treatment, but if this is impossible the lacrymation, if troublesome, can be relieved by partial or total removal of the lacrymal gland. In occupations in which the eyes are exposed to constant irritation from fine dust, chemical fumes or other causes, obstruction of the lacrymal passages may give rise to much inconvenience from excessive lacrymation; but apart from this the condition ought not to incapacitate a workman from following his occupation. Obstruction of the nasal duct, whether of traumatic or non-traumatic origin, gives rise to a collection of tears and other secretions in the lacrymal sac, which may become infected, forming a purulent dacryocystitis, and constituting a very serious source of danger to the eye in case of any injury to the cornea.

LAGOPHTHALMOS, or inability to close the eyelids, is most commonly due to disease or injury of the facial nerve, causing paralysis of the muscle, which closes the eyelids, but may also result from orbital tumours, exophthalmic goitre, staphyloma corneæ, distension of the eyeball by intra-ocular tumour, or any other condition which pushes the eyeball forward so as to mechanically prevent the lids from closing. When due to disease of the facial nerve (q.v.), lagophthalmos is associated with the other symptoms of that affection, and has the same causation and prognosis. In all cases the chief danger to the eye is that of ulceration of the cornea from constant exposure. This should be combatted by plastic operations to make new eyelids in the cicatricial cases and by tarsorrhaphy, or more or less extensive suturing of the upper and lower eyelid to each other, where practicable, in non-cicatricial cases in which the eye is not already lost.

LENS.—The crystalline lens is a transparent lens-shaped body situated behind the iris, between the aqueous humour and the vitreous ; it aids in bringing the rays of light to a focus on the retina. In young eyes the curvature of the lens can be increased, so as to enable objects close to the eye to be seen clearly ; but with increasing age this power gradually diminishes, and is finally lost altogether.

MIOSIS, or contraction of the pupil, may be unilateral or bilateral, and is sometimes accompanied by spasm of accommodation. It is a symptom of some diseases of the eye, and of certain stages of a number of diseases of the nervous system, *e.g.* locomotor ataxy and general paralysis of the insane. It may also be caused by certain drugs, either taken internally, *e.g.* morphia, or instilled into the conjunctival sac, *e.g.* eserin and pilocarpin.

When of traumatic origin it may be due to irritation from a foreign body in the cornea or iris, irritation of the third or the fifth cranial nerve, injury to the spinal column above the level of the dorsal vertebræ, commencing meningitis or paralysis of the sympathetic nerve, caused by a wound in the neck, when it is associated with enophthalmus, reduced tension of the eyeball, slight ptosis, unilateral perspiration, and capillary redness of the face.

This last form is usually permanent, but is not likely to interfere with the workman's labour (Beaumont).

A blow on the eye may cause miosis, with reduced tension.

MYDRIASIS, or dilatation of the pupil, may be unilateral or bilateral. It may vary in degree between a condition in which one pupil is a little larger than the other, but still continues to react, and one in which one or both pupils are widely dilated, so that scarcely any of the iris is visible, and quite inactive. It is usually associated with paralysis of accommodation (cycloplegia), but may occur independently. It is a symptom of certain eye diseases, *e.g.* glaucoma, and general diseases, *e.g.* anæmia, shock, heart and nervous diseases; it may be caused by the action of drugs, *e.g.* belladonna or its derivatives. When of traumatic origin it may be due to a blow on the eye, causing (*a*) a tear or rupture of the sphincter iridis; or (*b*) paralysis of the nerve endings in the muscle; injury causing paralysis of the third cranial nerve; injury causing irritation of the sympathetic nerve; thrombosis of the cavernous sinus (when the prognosis for life is most serious); insensibility of the retina; injury to the optic nerve or intracranial pressure, *e.g.* from abscess.

The form resulting from a blow on the eye is usually permanent, and may be associated with diminished tension of the eyeball, in spite of which there may be little or no reduction of visual activity.

NYSTAGMUS, or involuntary oscillation of the eyeballs, either horizontally, vertically, obliquely or in a rotary direction, may be congenital or acquired.

It is usually bilateral, but a few unilateral cases have been recorded. Two varieties of the condition have been described—pseudo-nystagmus, in which both eyes, when carried to a point near the limit of their excursion in the same direction, make a series of jerky movements on from this point and back to it again, but do not repass it ; and true nystagmus, in which the eyes make a series of very regular, short, quick oscillations about a central point.

Pseudo-nystagmus occurs almost constantly in hereditary ataxia, and is found frequently in multiple sclerosis, but as it is also present in a great variety of other nervous diseases, and even in people who are perfectly healthy, it is not of great importance as a diagnostic sign.

Nystagmus, may be caused by (1) conditions producing bilateral amblyopia in early infancy (congenital, optical or infantile), *e.g.* corneal opacities (especially those resulting from blenorrhœa neonatorum), congenital cataract, disease or abnormalities of the retina or choroid, albinism, total congenital colour blindness, or high degrees of refractive error ; (2) irritation arising from the ear (aural nystagmus) ; (3) nervous diseases, especially multiple sclerosis and syringo-myelia, but also in ataxic paraplegia, primary spastic paraplegia, hereditary ataxia, multiple neuritis, meningitis, sinus thrombosis, hæmorrhage and softening of the brain, tumours of the brain, &c. (Gowers), and spasmus nutans (Thompson, Spicer, Schäpringer) ; (4) poisons, *e.g.* ether, alcohol, cocaine, &c. ; (5) conditions causing constant strain of the eyesight from poor illumination, or excessive strain of the eye muscles, or both together (occupational). This is commonest among miners, but compositors, paper-makers, metal-rollers, and others who work with the eyes in a constrained position, may also suffer from it (Snell, Eversbusch).

Miners' Nystagmus is said to occur in 5 per cent. of all miners. It is associated with a twitching of the eyelids and with considerable diminution of the range of movement of the eyes, and is particularly liable to occur in patients whose vision is subnormal owing to errors of refraction, especially astigmatism. It causes much inconvenience to those suffering from it, and prevents them from following their usual occupation, as owing to the movements of the eyes everything at which they look appears to be in a state of perpetual motion, and in consequence their visual acuity is more or less reduced. When the movements cease, the vision becomes as good as it was previously. (In congenital nystagmus objects do not appear to move.)

The dazzling is usually noticed first in the evening when leaving work, and the movements of the eyes are always most marked in a dull light, and when the patient looks upwards and to one or other side.

The condition has been explained as being due (*a*) to the defective illumination from safety lamps and the blackness of the surroundings in coal mines, owing to which there is an absence of definite retinal impression, and consequent derangement of the co-ordinating centres; (*b*) to fatigue of certain of the extrinsic eye muscles, induced as a consequence of the miner's work in the pit necessitating an upward and more or less oblique gaze (Snell).

If underground work is completely given up, miners' nystagmus disappears in the course of time. It is doubtful whether a man who has once suffered from the disease can again work underground permanently, but in any case an attempt to do so until the symptoms have been entirely absent for at least six months will be soon followed by a relapse. Snell claims that if work in constrained positions, especially "holing," be avoided, an underground occupation can be followed by those who have suffered from nystagmus; but in some localities, *e.g.* the South Wales coalfield, the conditions of employment do not admit of such a distinction being made.

It has been found that men who are unable, owing to nystagmus, to work where safety lamps are used, may be able to do so where open lights are used; but Snell has shown that the disease may occur even in those who have never worked with safety lamps.

Snell has recently pointed out (*B. M. J.*, 1908, v, 11) that persons suffering from nystagmus cannot recognise the presence of a cap of flame until it has reached a large size, and it is therefore important that the overseers, whose duty it is to test for the presence of gas by means of such caps, should be free from it.

Nystagmus may occur as a result of traumatism causing (*a*) defective vision from leucoma, traumatic cataract, etc.; (*b*) nervous conditions, *e.g.* traumatic hysteria. Such cases are rare, the former being usually unilateral and the latter transitory.

Some few people have the power of voluntarily causing nystagmic movements of their eyes.

The **OPTIC NERVE** is the nerve which unites the eye with the brain, and transmits the sensation of light. It may be injured directly by sharp instruments pushed into the orbit, or indirectly as a complication of injuries to the head, probably as a result of fractures of the orbital walls, involving the optic foramen through which it passes. The result of such injuries is incurable blindness, either immediate from tearing of the nerve or coming on late from optic atrophy, caused by pressure of exudation or callus.

Atrophy of the optic nerve, with incurable blindness, may occur as a result of orbital cellulitis, which may be of traumatic origin.

Optic neuritis is frequently caused by increased intra-cranial pressure, which may be due to a tumour or an abscess, the latter possibly of traumatic origin. The pressure should be relieved by trephining when the prognosis for sight is good, but if the operation is delayed too long irreparable damage may be done to the nerve.

Optic neuritis may also be caused by meningitis, thrombosis of the cavernous sinus, orbital cellulitis, and empyema of one or more of the air sinuses in connection with the nasal cavity. In all cases the prognosis for sight is good if the cause of the inflammation is removed in time.

ORBIT.—The orbit is a pyramidal cavity which contains the eyeball and its optic nerve, the extra ocular muscles, the lacrymal gland, blood-vessels, lymphatic vessels, nerves, and a considerable quantity of fat.

Fracture of the orbit may result from blows on the head, and the issue may be fatal. In cases which are not fatal blindness may result from injury to the optic nerve, either directly by tearing, or indirectly from pressure of hæmorrhage, exudation or callus. If the fracture is compound it may lead to suppuration, which may be accompanied by necrosis of the bone and formation of a sinus which is frequently very difficult to cure.

Injuries of the orbit may be caused by pieces of metal, the bursting of bottles, prods of walking-sticks, &c., and are serious accidents. They may be complicated by direct injury to some of the muscles or nerves contained in the orbit, causing blindness if the optic nerve is involved, or the superior wall of the orbit may be perforated and the brain injured with fatal result. Apart from these complications, the wounds may be infected and set up cellulitis or abscess or periostitis, while as a secondary result a cerebral abscess may form.

Orbital caries frequently follows periostitis. It is usually the result of tuberculous disease or late syphilis, but the direct cause of its onset may be a wound.

It is a very tedious disease, and ends in suppuration, which may leave a chronic sinus and cause ectropion.

Orbital cellulitis may be caused by injury, by extension of inflammation from surrounding parts (especially erysipelas), by metastasis, or may occur idiopathically or as a sequela of fevers. It is a very painful affection, and a very serious one, as it may cause optic atrophy with consequent blindness, or may have a fatal result. Some rare cases run a chronic course, with very slight symptoms, which may be set down to malingering (Beaumont).

Orbital periostitis may be caused by blows, by extension from neighbouring cavities, by syphilis, and by rheumatism. It is a very slow disease, and may prove fatal from perforation of the orbital roof, causing meningitis or cerebral abscess. The inflammation frequently spreads to the cellular tissue, and sets up cellulitis.

PANOPHTHALMITIS is a purulent inflammation involving all the tissues of the eye, and resulting in complete blindness with shrinking of the eyeball.

Sympathetic disease is rarely, if ever, caused by panophthalmitis, or by the shrunken eyeballs resulting from it. Opinions are divided as to the advisability of removing eyeballs suffering from acute panophthalmitis, as deaths from meningitis are said to have followed such operations.

PHOTOPHOBIA, or dread of light, is a symptom of many eye diseases, particularly inflammations of the cornea.

The **RETINA** is the inner or nervous tunic of the eye, which changes the pictures of external objects formed on it into nervous energy, which in turn is conveyed by the optic nerve to the cortex of the brain, where they give rise to the sensations which are known as sight.

Diseases of the retina are usually symptoms of some general disease, but the following conditions in it may be caused by injury: (1) Traumatic anæsthesia of the retina; amblyopia, often considerable, accompanied by concentric contraction of the field, but without any visible ophthalmoscopic changes which follow a blow on the eye, *e.g.* with a fist, and may continue for a long time, but ultimately end in complete recovery. (2) Contusion of the retina (traumatic œdema of the retina, commotio retinæ, or Berlin's opacity), a cloudy condition of the retina accompanied by diminution of vision, and episcleral injection with contraction of the pupil, which does not readily yield to mydriatics. The condition passes off in a few days, when the vision is generally restored to its former acuteness. (3) Detachment of the retina; displacement of the retina from its normal position, so that it is separated from the choroid from which it normally receives a large part of its blood supply. Eyes with any considerable degree of myopia (short sight) are peculiarly liable to this disease, which may also be caused by an intra-ocular tumour or by injury. The prognosis is very bad, but recovery may take place in traumatic cases occurring in eyes which were previously healthy and not very myopic. (4) Rupture of the retina may occur as a result of a blow on the eye or of the concussion of an explosion. It is less common than rupture of the choroid, by which it is usually accompanied. Its seriousness depends on its position. If the macula lutea is involved, the injury to the sight is very grave, but if, as is usually the case, the tear is situated peripherally, the defect which is left may not be noticeable, but the contraction of the scar resulting from the injury may subsequently give rise to detachment of the retina.

Retinal Hæmorrhage occurs as a result of general disease, *e.g.* albuminuria, or poisoning by phosphorous, lead, arsenic, and of contusions. When of traumatic origin it usually becomes absorbed rapidly when the sight is restored, but even slight injuries of the eyeball may be followed by inflammation of the retina and choroid, leading to permanent and serious defect of vision.

Hæmorrhages from diseased conditions usually take longer to become absorbed than those of traumatic origin, and may be followed by extensive changes in the retina, and impair the sight materially.

Retinitis proliferans is a growth of new tissue from the retina into the vitreous. It may follow any retinal hæmorrhage, either traumatic or idiopathic, and is incurable; but the vision is often much better than would be expected from the ophthalmoscopic appearances.

SCLERA.—The sclera forms the posterior four-fifths of the fibrous tunic of the eyeball, the anterior fifth being formed by the cornea. It may be injured by foreign bodies (q.v.), burns, ruptures or perforating wounds.

Burns of the Sclera, if at all severe, usually cause loss of the eye.

Ruptures of the Sclera are caused by blunt force, such as a blow of a fist or stick or cow's horn, or with a medium-sized piece of wood or metal, or from striking the eye against a projecting object. They are usually situated close to and concentrically with the corneal margin, in its upper inner quadrant, and are almost always accompanied by iridodialysis and dislocation of the lens (which is often found outside the eye, beneath the conjunctiva), intra-ocular hæmorrhage, and tearing or detachment of the retina and choroid.

From the severity of these complications it will be readily understood that it is quite exceptional for an eye with scleral rupture to retain useful vision.

Perforating Wounds of the Sclera, if infected, always cause loss of the eye, but if aseptic they may heal up without inflammation, especially if they are clean cut; but if the edges of the wound do not lie in absolute apposition, the interval between them may be occupied by tissue or vitreous, which will become involved in the scar, and give rise to late complications. When the perforation is near to the corneal margin it may be followed by imperfect closure, with leaking of the aqueous.

When the perforation is caused by a foreign body which remains lodged in the eyeball, the prognosis, in the absence of infection, depends on the possibility of removing it.

SYMPATHETIC IRRITATION and OPHTHALMITIS.—These are conditions in an uninjured eye (the sympathising or second eye) caused by inflammation (irido-cyclitis) in the other eye (the exciting, injured, or first eye), due to perforation of the eyeball, usually from injury, but occasionally as a result of a corneal ulcer or an intra-ocular growth. These two conditions are to be clearly distinguished, and not to be regarded as different stages of the same affection.

Sympathetic Irritation is a reflex neurosis characterised by photophobia, lacrymation, pericorneal injection, difficulty in reading, and sometimes even amblyopia. It at once subsides if the exciting eye is removed, and does not leave any organic changes behind it.

SYMPATHETIC OPHTHALMITIS.—This disease only occurs where there has been in the exciting eye a perforation followed by irido-cyclitis.

It manifests itself as irido-cyclitis, or irido-choroiditis of a very severe type, often preceded or accompanied by optic neuritis of a very mild type. When severe the disease invariably leads to blindness of the sympathising eye, but in mild cases recovery may take place with good or even perfect vision, while there are a number of instances on record in which good vision has been retained in both eyes.

The following facts can be stated with regard to the disease. It never occurs except as a result of irido-cyclitis, set up by a perforation of the eyeball, usually caused by a wound involving the ciliary body, or by a foreign body which has pierced the tissues of the eye, and lodged in the interior of the eyeball ; it is very rarely, if ever, caused by eyes which have been lost from purulent panophthalmitis.

The smallest interval which is likely to intervene between the perforation in the exciting eye and the outbreak of inflammation in the sympathising eye is generally regarded as three weeks, but there are cases on record in which it has been claimed to be as low as four days (2 cases), six days (2 cases), ten days (2 cases), and fourteen days (1 case). Of these only the last can be regarded as undoubtedly genuine. The commonest interval between the perforation and the outbreak of inflammation in the other eye is from three to eight weeks, and the usual limit is passed when the sympathetic inflammation has failed to make its appearance before the end of the fourth month, although it has been known to occur after intervals of 35, 45 and 47 years.

Enucleation of the exciting eye prevents the occurrence of sympathetic ophthalmitis which has not yet been established. It is possible, however, that an infection which has taken place before the enucleation may not declare itself until a later period; but such cases are always mild, and the period during which they are liable to occur is limited.

The longest interval recorded between the enucleation of an injured eye and the outbreak of sympathetic ophthalmitis in the remaining eye is fifty-four days (Stephenson, *Trans. Ophthal. Soc.*, vol. xxi, p. 37).

Evisceration (removal of the contents of the eyeball), or its modifications (Mules's operation, etc.), do not give quite such security against sympathetic ophthalmia as enucleation (Report of Committee of Ophthalmological Society, *Trans. Ophthal. Soc.*, vol. xviii), while operations which do not remove the ciliary body, so far from being safeguards, are regarded as liable to cause the disease.

When sympathetic ophthalmitis is already established the exciting eye should not be enucleated if it retains any useful vision, as it is doubtful whether its removal has any beneficial influence on the disease, while it may ultimately prove to be the better eye of the two.

In cases in which a sympathetic ophthalmitis has subsided, leaving some vision, a favourable opinion should not be given for twelve months, and during that time the workman should not be allowed to return to work (Beaumont).

SYNECHIÆ.—When the cornea is perforated, as the result of an injury or disease, a fold of the iris is frequently carried forward into the wound, and unless it is removed or replaced it becomes adherent, and constitutes an anterior synechiæ. This condition may give rise to glaucoma and blindness, even after the eye has appeared for a considerable period of time to have recovered with good vision, or may set up an irritable condition of the eye. Corneal scars, in which the iris is involved, are peculiarly liable to break down as the result of slight injuries, which may even cause loss of the eye. Adhesions between the posterior surface of the iris and the anterior capsule of the lens are known as posterior synechiæ; they are caused by iritis, either idiopathic or traumatic, and are in themselves of no importance unless the whole circumference of the pupil becomes involved, when they interfere with the circulation of the intra-ocular fluids, and cause secondary glaucoma.

The **VITREOUS** is a transparent, jellylike substance, which fills the cavity of the eyeball behind the lens. Injuries to it occur as complications of perforating wounds of the eyeball. In diseased conditions of the eye the vitreous may become fluid, causing a predisposition to detachment of the retina. Slight injuries to the eye, even in young subjects, may be followed by hæmorrhage into the vitreous, which may leave the sight much impaired (Antonelli, *La Clinique Ophtalmologique*, Juin, 1909).

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